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ABSTRACT

This guide for industrial arts grades 7-9 provides teachers with a curriculum for the subject cluster of construction. An "Overview" section presents the rationale, discusses how the content of the program is related to the developmental stages of the adolescent, describes the structure of the industrial arts program, and lists program goals and objectives. The "Implementation" section covers program design, scope and sequence, time allotment, integration, selection of materials, evaluation, and students with special needs. The construction subject cluster has one area of study--construction--and includes 16 core and 5 optional modules. Each module includes a major objective, estimated time, and student objectives with corresponding suggested activities and notes and suggested resources. The 16 core modules are student orientation, safety, careers, measurement, planning and design, consumerism, site selection, materials, separation, fastening, footings and foundation, floors, walls and partitions, roofs, enclosing, and energy and insulation. The five optional modules are exterior finish, interior finish and trim, plumbing system, electricity, and landscaping. A bibliography is appended. (YLB)

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industrial arts 7-9
construction

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These guides for the Industrial Arts 7-9 subject clusters (Construction, Graphic Communications, Power/Energy, and Manufacturing) replace the 1969 Industrial Arts Teacher's Guide for grades seven, eight and nine; and the interim guides for Construction, Graphic Communications, Power/Energy, and Manufacturing issued in 1976. They have been developed as part of the overall revision of the industrial arts programs for the junior high schools of Manitoba. They are based on recommendations included in the Report of the Home Economics and Industrial Arts Task Force of 1978 and Education for the Middle Years, a 1977 position paper of the Middle Years Program Review Committee, as well as suggestions from junior high school and community college teachers.

Industrial Arts 7-9: Construction, Graphic Communications, Power/Energy, and Manufacturing (1983) become the approved provincial guides for industrial arts in the junior high school, effective the fall of 1983.

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OVERVIEW

INTRODUCTION

The junior high school industrial arts curriculum has been revised to reflect the philosophy of the Middle Years Program Review Committee, and to provide objectives and learning experiences which will enable students to maximize their effectiveness as individuals within the family, business, and community. The focus is on the well-being of individuals, groups, and businesses/industries, the environmental qualities which affect that well-being, and on how individuals and industry in turn affect the environment.

The Middle Years Program Review Committee and the Home Economics and Industrial Arts Task Force have recommended that the curriculum:

1. de-emphasize sex bias in roles and expectations normally assigned to home economics and industrial arts programs;
2. minimize the sequencing of courses to enable students to participate in a wide variety of learning experiences, by providing an exploratory program, particularly at the introductory level.

A combined home economics/industrial arts exploratory program, at the introductory level, will be available.

The curriculum also reflects the effects of a rapidly changing society, awareness of many forms of industry and industrial processes, and social and technological changes which influence life styles and business/industry.

This guide should assist teachers in meeting students' physical, social, emotional, and intellectual needs through the emphases on the continuing responsibilities of individuals and groups, and on the processes by which decisions are made and action is taken. This guide provides student objectives, suggested activities, notes, and resources to assist teachers in planning programs related to their students and community.

RATIONALE

The study of industrial arts in the junior high school program in Manitoba is designed to help students clarify values, set personal goals, and acquire skills for improving the quality of life for individuals and groups in business, industry, community, and society.

Industrial arts has much to contribute to the growth and development of students in the middle years and to the curriculum of the middle years school. Industrial arts helps emerging and early adolescents in their search for identity and development of self-concept; encourages the development of such basic skills as learning how to learn and making decisions; encourages the development of skills in personal and family life and in business and industrial processes; explores possible career choices in industrial-arts related areas; and provides opportunities for students to discover new interests, growing capacities and the need for effective use and control of resources and technologies.

The study of industrial arts will enable students to:

1. Appreciate the interdependence of the individual, the family, and groups in business/industry and society, and understand the factors in society, business/industry, and the community which assist individuals in meeting basic needs.

2. Understand the influences which affect decision-making and realize that one can use natural and industrial resources effectively in making choices which are satisfying and accountable to self, family, groups, business/industry, and community.

3. Identify values and priorities in life and consider the quality of life as much as the quantity of production and consumption.

4. Understand the ways in which an individual, alone or as part of a group, can increase opportunities to achieve potential and satisfaction in life.

5. Appreciate good craftsmanship and design, both in the products of modern industry and in artifacts from past cultures.

6. Understand the necessity to adjust and adapt in a world of change.

7. Develop knowledge and skills to improve human relations and to meet present and future needs of society.

8. Appreciate the interdependence and the importance of practicing the management skills of planning, organizing, and controlling work.

9. Develop critical thinking related to materials, tools, and processes of industry, and creative expression related to industrial materials.

10. Recognize the importance of safety in the use and maintenance of tools, energy, equipment, and materials appropriate to various technologies in a productive society.

11. Develop positive attitudes towards safety, conservation, ecology, and technology.

12. Recognize consumer rights and responsibilities relating to self and to various types of industries.

13. Understand and recognize the vocations and general occupational characteristics of various types of industries.

14. Recognize the relationship of personal interests, abilities, preferences, and values to various career areas.

THE DEVELOPMENTAL STAGES OF ADOLESCENTS

The content of the industrial arts programs is closely related to adolescent developmental stages. The adolescent years are a period of transition, and within this period, students' development varies widely.

An outline of typical characteristics of junior high students has been used as a guide in creating, adapting, and suggesting learning experiences. Characteristics of adolescents may be described under the headings: cognitive, physical, emotional, social, and moral. All aspects of development are interconnected.

ADOLESCENT NEEDS	CHARACTERISTICS	APPROPRIATE ACTIVITIES
Cognitive: Develop intellectual activity which is logical and abstract, with thinking becoming more mobile, flexible and less egocentric.	Interested primarily in self, but gradually developing greater interest in the outside world and in family problems.	Begin with interests and concerns, then proceed to family, community and society. The 12-year-old is concerned with lack of resources. Begin with this problem and proceed to a discussion of family resources, then to resources in industries and in the community.
Physical: Develop one's physique and use the body effectively.	A physical age with tremendous variations.	Discuss the role of the individual, family, and business in meeting physical needs.
	Growth makes demands on energy.	Emphasize nutritious foods for growth and development required to learn and work effectively.
	Growth affects self-concept.	Encourage participation in projects to promote personal satisfaction and creativity.
	Concern with awkwardness and physical appearance.	Identify and discuss factors which affect personal appearance and safety in a work environment.
	Experience difficulty in carrying out long-range projects. May be restless with short attention span.	Provide variety in content and methods. Work on projects that can be completed in a short period of time or completed in sections. Encourage active participation in learning.

ADOLESCENT NEEDS	CHARACTERISTICS	APPROPRIATE ACTIVITIES
Emotional: Emotional needs are closely linked to physical needs.	Variable and intense.	Help students recognize that changes in their development affect behavior.
	Great stresses and contrasts.	
	Need to come to terms with emotions.	
	Inclined to be enthusiastic and often impulsive.	Create an atmosphere for tapping enthusiasm and impulse with techniques such as brainstorming, ad lib skits, word association, self-chosen projects and assignments.
Achieve emotional independence of parents and other adults.	Seeking identity.	Encourage students to identify individual strengths that lead to a greater understanding and acceptance of self.
Social: Desire and achieve socially responsible behavior.	Relationship with peers important.	Contrast activities and relationships with peers and family.
	Group oriented, but conflict between group and individuality.	Provide opportunities to work individually and in groups.
	Increasing maturity.	Help students to appreciate that each person is different physically and mentally, possessing characteristics which make one worthy of acceptance.
	Rise of sexuality and relationships with opposite sex.	

ADOLESCENT NEEDS	CHARACTERISTICS	APPROPRIATE ACTIVITIES
Moral: Acquire a set of values and an ethical system as a guide to behavior.	Live primarily in the present, now rather than tomorrow, but gradually growing more concerned with immediate and distant future. Social and intellectual development have important consequences for moral growth. Make personal evaluations. Begin to formulate own moral code. Less inclined to accept parental values. Begin to put self in another's place.	Build on present interests and concerns.

STRUCTURE OF THE PROGRAM

The Industrial Arts curriculum for grades seven, eight, and nine is divided into subject clusters, areas of study, and modules, rather than by grade designation. The division and the depth of content and objectives for each area of study in each grade level, will depend upon laboratories available, the time allotment, and the organization of the program in a school. Curriculum content proceeds from the establishment of basic understanding and skills at the introductory level, to a more intensive study and understanding at subsequent levels.

There are four subject clusters: Construction, Graphic Communications, Power/Energy, Manufacturing. Each subject cluster contains areas of study. Construction has one area of study: Construction; Graphic Communications has three areas of study: Drafting, Graphic Arts, Graphic Communications; Power/Energy has three areas of study: Electricity/Electronics, Power Mechanics, Power/Energy; and Manufacturing has four areas of study: Metalwork, Plastics, Woodwork, and Manufacturing. Each area of study is comprised of core modules (C) or core and optional (O) modules. Three of the core modules, Student Orientation, Safety, and Careers, are common to all areas of study.

The subject cluster for Construction comprises 16 core and 5 optional modules.

Construction

I Student Orientation (C)
II Safety (C)
III Careers (C)
IV Measurement (C)
V Planning and Design (C)
VI Consumerism (C)
VII Site Selection (C)
VIII Materials (C)
IX Separation (C)
X Fastening (C)
XI Footings and Foundations (C)
XII Floors (C)
XIII Walls and Partitions (C)
XIV Roofs (C)
XV Enclosing (C)
XVI Energy and Insulation (C)
XVII Exterior Finish (O)
XVIII Interior Finish and Trim (O)
XIX Plumbing System (O)
XX Electricity (O)
XXI Landscaping (O)

The Graphic Communications subject cluster includes 13 core modules for Drafting, 14 core and 3 optional modules for Graphic Arts, and 19 core and 3 optional modules for Graphic Communications.

	Drafting	Graphic Arts	Graphic Communications
I	Student Orientation (C)	Student Orientation (C)	Student Orientation (C)
II	Safety (C)	Safety (C)	Safety (C)
III	Careers (C)	Careers (C)	Careers (C)
IV	Measurement (C)	Measurement (C)	Measurement (C)
V	Planning and Design (C)	Planning and Design (C)	Planning and Design (C)
VI	Consumerism (C)	Consumerism (C)	Consumerism (C)
VII	Sketching (C)	Design Concepts (C)	Sketching (C)
VIII	Mechanics of Drawing (C)	Screen Process (C)	Mechanics of Drawing (C)
IX	Pictorial Drawing (C)	Relief Printing (C)	Pictorial Drawing (C)
X	Orthographic Drawing (C)	Black and White Photography (C)	Orthographic Drawing (C)
XI	Drawing Interpretation (C)	Process Photography (C)	Drawing Interpretation (C)
XII	Drawing Reproduction (C)	Planographic Printing (C)	Design Concepts (C)
XIII	Electronic Systems (C)	Intaglio Printing (C)	Screen Process (C)
XIV		Packaging and Presentation (C)	Relief Printing (C)

	Drafting	Graphic Arts	Graphic Communications
XV		Color Photography (O)	Black and White Photography (C)
XVI		Office Graphic Arts Equipment (O)	Process Photography (C)
XVII		Electronic Systems (O)	Planographic Printing (C)
XVIII			Intaglio Printing (C)
XIX			Packaging and Presentation (C)
XX			Color Photography (O)
XXI			Office Graphic Arts Equipment (O)
XXII			Electronic Systems (O)

The Power/Energy subject cluster includes 13 core modules for Electricity/Electronics, 11 core modules for Power Mechanics, and 11 core modules for Power/Energy.

	Electricity/Electronics	Power Mechanics	Power/Energy
I	Student Orientation (C)	Student Orientation (C)	Student Orientation (C)
II	Safety (C)	Safety (C)	Safety (C)
III	Careers (C)	Careers (C)	Careers (C)
IV	Measurement (C)	Measurement (C)	Measurement (C)
V	Planning and Design (C)	Planning and Design (C)	Planning and Design (C)
VI	Consumerism (C)	Consumerism (C)	Consumerism (C)
VII	Components (C)	Tools and Fasteners (C)	Tools and Fasteners (C)
VIII	Tools and Fasteners (C)	Energy Sources (C)	Energy Sources (C)
IX	Energy Sources (C)	Energy Conversion (C)	Energy Conversion (C)
X	Energy Conversion (C)	Transmission of Power (C)	Transmission of Power and Energy (C)
XI	Energy Transmission (C)	Routine Care and Maintenance (C)	Power Systems (C)
XII	Energy Systems (C)		
XIII	Electrical Wiring (C)		

The Manufacturing subject cluster includes 15 core modules for Metalwork, 14 core modules for Plastics, 14 core modules for Woodwork, and 15 core modules for Manufacturing.

	Metalwork	Plastics	Woodwork	Manufacturing
I	Student Orientation (C)	Student Orientation (C)	Student Orientation (C)	Student Orientation (C)
II	Safety (C)	Safety (C)	Safety (C)	Safety (C)
III	Careers (C)	Careers (C)	Careers (C)	Careers (C)
IV	Measurement (C)	Measurement (C)	Measurement (C)	Measurement (C)
V	Design and Construction (C)	Design and Construction (C)	Design and Construction (C)	Design and Construction (C)
VI	Consumerism (C)	Consumerism (C)	Consumerism (C)	Consumerism (C)
VII	Materials (C)	Materials (C)	Materials (C)	Materials (C)
VIII	Separation (C)	Separation (C)	Separation (C)	Separation (C)
IX	Forming (C)	Forming (C)	Forming (C)	Forming (C)
X	Conditioning (C)	Fastening (C)	Fastening (C)	Conditioning (C)
XI	Fastening (C)	Finishing (C)	Finishing (C)	Fastening (C)
XII	Finishing (C)	Jigs and Fixtrues (C)	Jigs and Fixtures (C)	Finishing (C)
XIII	Jigs and Fixtures (C)	Mass Production (C)	Mass Production (C)	Jigs and Fixtures (C)
XIV	Mass Production (C)	Enterprise System (C)	Enterprise System (C)	Mass Production (C)
XV	Enterprise System (C)			Enterprise System (C)

Each of the modules for the 11 areas of study includes the following:

1. Major objectives accompany each module and provide an overview of what the student should achieve through the study of the module.

2. Student objectives are related to topics and are sequenced to lead to an understanding of the major objective. The objectives are based on students' needs and average abilities. Learning one objective leads to insight into how to proceed to the next objective, and, eventually, to the understanding of the major objective and the topics. If students are aware of the objectives, they may identify with them more closely and aim to achieve them.

3. Suggested activities and notes are designed to help students achieve objectives. These experiences help the students to acquire knowledge, learn skills, evaluate attitudes and values, and develop understanding, appreciation, and perception of topics and objectives. The learning experiences and activities should be added to and updated continually by the teacher and the students.

4. Resources are suggested to assist the teachers and the students in developing and understanding the topics, objectives, and learning experiences. The resources should be added to and updated continually by the teacher and the students.

PROGRAM GOALS

The general goals of the junior high industrial arts program are to assist students to:

- acquire an understanding of self.
- understand how personal, business, industrial, and societal needs are met through positive interrelationships.
- develop skills to meet needs in the home, in the community, and in business and industry.
- develop a high degree of safety consciousness.
- acquire basic skills in the use of common industrial tools, machines, and processes.
- become increasingly questioning, creative, and critical consumers of natural and industrial resources and accept responsibilities for decisions made.
- develop problem-solving and creative abilities involving materials, processes, and products of industry.
- become involved in energy-saving, ecology, conservation, and technological studies and activities.
- develop confidence, high standards of performance, and a sense of pride in achievement.
- discover and develop talents, aptitudes, interests, and potential in technical fields and applied sciences.
- acquire basic skills and knowledge related to materials and technical procedures.
- gain an insight into various types of industries and their relationship to individuals, communities, society, and economic systems and conditions.
- develop creative potential, both avocationally and vocationally.
- achieve a degree of competency that leads to further education, training, and employment.
- acquire an understanding of the relationship between technological advances, requirements of industry, careers, and economic conditions.

- develop skills to make choices leading toward the attainment of a better quality of life.

PROGRAM OBJECTIVES

The classification of educational objectives--psychomotor, affective, and cognitive--have a relationship to each other. Frequently, at least two, if not all three, types of learning occur simultaneously. The teacher may choose to concentrate on one objective at a time or to correlate two or more objectives. It is possible to incorporate all three types of objectives as components of behavior or action. The student may be developing a skill and at the same time acquiring an attitude or value as well as a knowledge of principles related to the skill.

MAJOR OBJECTIVES: CONSTRUCTION

Students of Construction should gain an understanding of its relation to self, people, industry, economics, and technology. Study in this area should develop understanding, decision making, appreciation, and skills in the selection and use of materials, tools, and processes employed in building construction. Development of these can lead to participation in practical, creative, and satisfying learning experiences, and to the ability to judge quality construction products and to appreciate high standards of workmanship and the dignity of work. Optional major objectives are identified by (O).

The student should be able to:

- Explore the significance of industrial arts in relation to the needs of individuals, industry, and society.
- Develop safety consciousness in the use of tools and

equipment through a wide range of exploratory experiences related to individuals and to production and servicing aspects of hobbies and industries.

- . Gain knowledge and skills related to imperial and SI metric systems of measurement, measuring devices, and testing devices.
- . Gain information about the general occupational characteristics of a variety of career fields and to match interests, abilities, likes, dislikes, and values to characteristics of various careers.
- . Gain an understanding of and to develop skills in planning, design, and architectural drawings.
- . Explore the complexity of the economy in relation to consumer awareness and construction.
- . Explore site selection in relation to the successful erection of a building.
- . Gain knowledge of the basic types of home construction and the common building materials.
- . Obtain knowledge about and to develop skills in the use of hand and power tools applicable to the separation processes in construction.
- . Gain knowledge about mechanical and adhesive fastening procedures and to develop skills in the use of tools and materials applicable to these procedures.
- . Recognize the significance of, to gain knowledge about, and to explore skills pertinent to footings and foundations.
- . Gain knowledge about the importance of sound, rigid floor frames and skill in their construction.
- . Obtain information and to develop skills related to the construction of wall and partition framing.
- . Collect information about roof styles and to gain skills pertinent to roof framing and construction.
- . Explore the construction technology, skills, and materials used to enclose the exterior of a structure.
- . Explore the construction technology, knowledge, skills, methods, and materials related to energy and insulation.
- . Explore the construction technology, skills, methods, and materials used to finish the exterior of a structure (O).
- . Explore the construction technology, skills, methods, and materials used to finish and trim the interior of a structure (O).
- . Gain knowledge about plumbing systems and to use skills to complete simple activities related to plumbing (O).
- . Gain knowledge about electricity and inside electrical systems and to use skills to connect a basic circuit (O).
- . Explore the construction technology pertinent to landscaping and to design a landscape for completing the construction site (O).

OBJECTIVES: CONSTRUCTION MODULES

I. Student Orientation (C)

The student should be able to:

- . define Industrial Arts;
- . develop an understanding of the role of industrial arts;
- . recognize the relationship between junior high school and senior high school industrial arts;
- . collect information about the avocational and vocational activities and interests in industrial arts;
- . list the subject clusters for junior high school industrial arts;
- . identify the areas of study for each of the subject clusters;
- . recognize the modules for each area of study;
- . identify the industrial arts program in local school division/school(s).
- . identify reference materials;
- . develop the ability to use reference materials;

- identify community resources.

II. Safety (C)

The student should be able to:

- understand the importance of safety;
- identify and follow behaviour conducive to safety;
- identify and explain symbols denoting hazards;
- accept responsibility for developing safety habits;
- explain the causes and effects of common industrial accidents;
- demonstrate a knowledge of the organization of the industrial arts laboratory;
- recognize the relationship of laboratory layout to safety;
- recognize the potential hazards inherent in tools, equipment, machines, and materials;
- explain the purpose of proper storage of tools, equipment, and materials;
- explain the importance of safe clothing;
- wear clothing appropriate for industrial arts laboratories;
- understand the importance of protective devices
- use protective devices when required;
- describe daily procedures to be followed in industrial arts laboratories;
- identify and accept responsibility for housekeeping practices;
- identify emergency procedures;
- practice and use emergency procedures.

III. Careers (C)

The student should be able to:

- develop an awareness of the major groups of occupations;
- collect information about careers related to the major groups of occupations;
- identify careers related to the areas of study in the industrial arts program;
- develop an awareness of skills and aptitudes required for the major groups of occupations;
- identify skills required for specific jobs;
- identify personal interests, abilities, and needs;
- recognize the relationship of attitudes to working conditions;
- identify realistic educational and training plans for specific occupational areas;
- recognize the impact of technology on careers;
- explain the influence of social and economic trends on careers;
- identify the ways in which jobs are advertised;
- understand the purposes of a job description;
- explain the need for a resumé, an application, and an interview.

IV. Measurement (C)

The student should be able to:

- define measurement;
- explain the need for measurement;
- identify the basic types of quantity measurement;
- list and give application examples of SI metric and imperial units of measurement used in construction;

- identify common measuring tools;
- use common measuring tools to measure the following quantities: length, area, volume, mass, temperature;
- identify common devices to test vertical and horizontal levels and elevations;
- use testing devices.

V. Planning and Design (C)

The student should be able to:

- develop an understanding of the importance of planning;
- define planning;
- identify the components of planning;
- recognize the fundamentals of design;
- describe the factors to be considered in the design process;
- identify the steps in the design process;
- define architectural drawing/blueprint;
- recognize types of architectural drawings/blueprints;
- identify the types of working drawings;
- recognize the language and symbols of architectural drawings;
- explain the purpose of construction specifications;
- recognize the importance of building codes;
- read architectural drawings/blueprints;
- identify basic drafting tools;
- use basic drafting tools;
- use architectural drawings/blueprints.

VI. Consumerism (C)

The student should be able to:

- define economic system;
- explain the basic parts of economic systems;
- identify basic types of inputs;
- identify human needs;
- explain how construction meets human needs;
- explain the relationship between construction and the economy;
- recognize the concept of quality versus cost;
- explain the role of supply and demand;
- describe the effects of inflation;
- identify the positive and negative aspects of credit buying;
- explain the purpose and influence of advertising.

VII. Site Selection (C)

The student should be able to:

- define site;
- identify criteria for selecting a site;
- explain the relationship of physical characteristics to site selection;
- recognize the need for utilities;
- recognize the need for land restrictions and zoning laws;
- describe the relationship between site selection and cost;
- explain the purpose of surveying;
- define elevation, distance, and angle;
- identify the methods for determining locations and elevations of building sites;
- read elevations and contours;
- use a transit level to measure elevations and to locate building sites.

VIII. Materials (C)

The student should be able to:

- identify basic house styles;
- collect information about types of prefabricated houses;
- recognize the relationship between energy conservation and house styles;
- identify classes of building materials;
- recognize the types of structural and finishing materials used in construction;
- describe the properties and uses of the various types of building materials.

IX. Separation (C)

The student should be able to:

- define *separation*;
- identify methods of separation;
- identify common hand tools for shearing, chipping, paring, and shaving;
- use hand tools for each separation process;
- perform the processes with an increasing degree of accuracy;
- identify common power tools for shearing, chipping, paring, and shaving;
- use power tools for each separation process;
- perform the processes with an increasing degree of accuracy.

X. Fastening (C)

The student should be able to:

- define *fastening*;
- identify methods of fastening;
- explain the concept of mechanical fastening;
- identify common mechanical fasteners;
- select tools to use with common mechanical fasteners;
- use mechanical fasteners and related tools;
- perform the mechanical fastening processes with increasing proficiency;
- explain the concept of adhesive fastening;
- identify common adhesive fasteners;
- select tools to use with adhesive fastening;
- use adhesive fasteners;
- perform the adhesive fastening processes with increasing proficiency.

XI. Footings and Foundations (C)

The student should be able to:

- define *footing*;
- explain the purpose of footings;
- recognize the different types of footings;
- define *foundation*;
- identify the parts of a foundation;
- define *form*;
- describe the different types of foundation forming for a concrete slab, concrete wall, and wooden wall;
- recognize the basic knowledge and techniques related to the use of concrete.

XII. Floors (C)

The student should be able to:

- define *floor plan*;
- explain the purpose of a floor plan;

- draw a simple floor plan;
- recognize the relationship of the floor frame to a building;
- identify the various types of supports for floors;
- explain the function of the parts of a floor frame;
- construct a floor frame.

XIII. Walls (C)

The student should be able to:

- define wall;
- recognize the relationship of wall framing to a building;
- define partition;
- identify the main types of partitions;
- define platform construction;
- describe the function of platform construction;
- explain the functions of the essential parts of walls and partitions;
- prepare a scale drawing for framing walls and partitions;
- construct wall and partition framework.

XIV. Roofs (C)

The student should be able to:

- describe the functions of roofs;
- identify roof styles;
- define roof framing;
- explain how roofs are sized;
- identify the parts of a conventional wood roof frame;
- prepare a scale drawing for a conventional wood roof frame;
- construct and shingle a conventional wood roof.

XV. Enclosing (C)

The student should be able to:

- describe roof enclosing;
- explain the function of enclosing;
- recognize the relationship between wall framework and enclosing;
- identify the materials used for enclosing walls, doors, and windows;
- enclose walls, doors, and windows.

XVI. Energy and Insulation (C)

The student should be able to:

- describe the relationship of energy sources to building structures;
- identify categories of energy sources;
- define insulation;
- explain the purposes of insulation;
- identify types of insulating materials;
- compare the properties of insulating materials;
- describe methods of installing insulation.

XVII. Exterior Finish (O)

The student should be able to:

- describe the function of exterior finish;
- identify the main categories of exterior finishes;
- recognize the common structural exterior finishes;
- explain the properties of the common structural exterior finishes;
- apply structural exterior finishes;

- recognize common applied exterior finishes;
- explain the properties of the common applied exterior finishes;
- use applied exterior finishes.

XVIII. Interior Finish and Trim (0)

The student should be able to:

- describe the function of interior finish;
- identify the main categories of interior finishes;
- recognize the common structural interior finishes;
- explain the properties of the common structural interior finishes;
- apply structural interior finishes;
- recognize the common applied interior finishes;
- explain the properties of the common applied interior finishes;
- use applied interior finishes.

XIX. Plumbing System (0)

The student should be able to:

- define plumbing;
- identify purposes of a plumbing system;
- identify the common sources of water supply;
- recognize common methods of distribution;
- use some basic plumbing skills;
- recognize the need for different methods of waste disposal;
- identify the common methods of waste disposal.

XX. Electricity (0)

The student should be able to:

- identify sources of electric power;
- recognize the methods of distributing electricity;
- describe the purpose of an inside electrical system;
- recognize the methods of distributing power inside a building;
- develop an understanding of electrical terminology;
- identify basic tools and fittings used by electricians;
- connect a basic circuit.

XXI. Landscaping (0)

The student should be able to:

- define landscaping;
- identify the purposes of landscaping;
- describe the principles of landscaping;
- recognize the need for pleasant surroundings;
- explain how aesthetic value influences property value;
- design landscapes.

# implementation

IMPLEMENTATION

PROGRAM DESIGN

The curriculum guides have been designed to help teachers meet the needs of adolescents, with relevance to the rapid changes in society. These guides are flexible in order to encourage teachers to use personal knowledge and creativity in planning and implementing programs for each of grades seven, eight, and nine. The program contains the following features:

1. The format of the previous industrial arts curriculum has been changed and the subject content is more comprehensive. The format contains subject clusters, areas of study for each subject cluster, and core and optional modules for each area of study.

2. Practical and theoretical knowledge are interrelated. The content is practical in its purpose, organization and use, and theoretical in recognizing and understanding the concepts of self and interpersonal relationships, and the processes by which problems are solved and decisions are made.

3. Ideally, the curriculum is student-oriented in content and in approach to instruction. Emphasis is placed on creative exploration, self-direction, and independence. Because peer relationships are so important, some group work is emphasized. Instruction should be flexible to accommodate the wide variation in individual growth rates and stages of development.

4. The industrial arts curriculum has clearly defined objectives and program goals which become the criteria by which content is specified, procedures are developed, materials and resources are selected, and evaluative techniques are prepared.

5. Core modules with accompanying objectives have been identified for each area of study. For extended programs and maximum time allotment, teachers are expected to pursue topics beyond the core modules.

6. The sequential order within the subject clusters provides a systematic approach to the development of the program. The following are other approaches which will allow teachers flexibility in selecting learning content and processes to help students develop skills, attitudes, and understanding as bases for making and implementing reasonable, responsible decisions.

   The Process Approach involves the mastery of essential processes, such as searching, classifying, and categorizing information; hypothesizing, testing, valuing, criticizing, planning, problem-solving, and decision-making; and reporting.

   The Project Approach incorporates a number of different educational activities, such as investigating, analyzing, planning, constructing, synthesizing, evaluating, purposing, defining, and relating. The project should be a means to a goal and not the goal itself. The purposes of the project approach are to implement and develop the content and processes related to the area of study, as well as to contribute to the development of individuals.

The Decision-Making Approach is basic to all areas of the program and includes the processes of inquiry, valuing, decision-making, and action.

The Needs Approach assumes that individuals and groups of individuals have certain physical, aesthetic, social, and psychological needs, and is based on meeting those needs.

The Problem Approach, the case study, is based on the observation that individuals, groups, communities, and businesses encounter problems which relate to survival and living in society. The techniques used in the classroom should include a variety of problem situations related to everyday living.

7. Because learning is unique for each student, in every aspect of industrial arts, a rich environment for exploration must be provided. The environment for learning should include attractive, well organized and safe surroundings, suitable and sufficient materials, and good working equipment.

   Learning is facilitated if student purposes are achieved and if the student participates in the selection and planning of classroom projects. Classroom experiences should progress from one successful accomplishment to another.

8. The suggested activities are designed to help students achieve objectives. These experiences help students acquire knowledge, learn skills, evaluate attitudes and values, and develop understanding, appreciation, and perception. The most relevant activities provide the understanding necessary to lead to the achievement of the objective and greater support and credibility to the topic.

   The activities are suggestions only and are intended to provide initial assistance in developing a wide range of activities to meet the students' needs. Students should be involved in the selection of learning experiences. Teachers must consider the cultural background of students, previous experience, and students with special needs to provide maximum opportunities for student learning.

   The structure of the content is the key to the encouragement of further learning.

SCOPE AND SEQUENCE

The subject clusters and areas of study taught will be dependent upon the type of laboratory and equipment. Some of the modules for the areas of study chosen may be taught separately as outlined, or combined. Industrial arts classes may be coeducational, all girls or all boys, or scheduled by class or areas of study selected.

Teachers should emphasize and integrate vocabulary study, safety, consumerism, career information, decision-making, interpersonal relationships, positive attitudes and work habits, communication skills, resource management, needs, values, goals, and laboratory organization throughout the program. To this end, these topics are woven into each area of study.

The scope and sequence should be a developmental progression of tasks and learning related to the areas of study and the modules chosen for each grade level. The following are criteria to consider when making choices:

1. the logical development of learning in each area;
2. the geographical and cultural background of the students;
3. students' maturation;
4. students' needs, including special needs, developmental tasks, experiences;
5. the amount of repetition that may be justified;
6. provision for new and exciting experiences;
7. the extent to which learning can be extended;
8. the resources available;
9. the most effective use of time, energy, and equipment.

TIME ALLOTMENT

Recommended time allotment for junior high industrial arts is 10% of the total program, 30 minutes daily/150 minutes weekly. One percent of time equals approximately 15 minutes of work per week. It is suggested that industrial arts be scheduled twice in the week or cycle. Different time blocks may have to be planned for students who have to travel to attend industrial arts classes. The time may also limit the number of objectives and/or projects which can be selected. It is recommended that the following flexible time allotments be used for the various grade levels:

. Grade 7 - 10-12%
. Grade 8 - 10-12%
. Grade 9 - 10-12%
. O.E.C. Grades 7, 8, 9 - 14-20%

There should be a balance of time alloted to the theoretic and practical aspects of the program. It is recommended that teaching theory comprise 30-40% of the time allotment and student practice comprise 60-70%. The estimated time listed for each module in the guide should be followed during instruction of theory and practice.

INTEGRATION

Within the industrial arts program, specific approaches and topics may be supportive of other programs in the school. Industrial arts students may share and integrate studies in such subjects as related mathematics, science, communication, and work adjustment (human relations) with mathematics, science, English, and guidance programs. In addition, units on energy and resource management, consummer education, career awareness, safety, and occupational aspects may be developed from topics included in the industrial arts curriculum.

Schools at the middle years level may develop a program for the pre-adolescent as an exploratory program prior to the implementation of industrial arts at the introductory level.

SELECTION OF MATERIALS

The suggested activities in the curriculum refer, in some instances, to approved textbooks and support materials which are basic to these activities. Classroom sets of selected, recommended materials would be desirable. There should be a balance of materials in and among all areas. Additional recommended references for each area of study are included in the bibliography.

The use of a variety of resource materials enriches the experiences of students in individual and group work. Because a wide variety of textbooks and publications are available in Manitoba schools, each teacher can support instruction with current information, suitable to student needs. Recently published textbooks and support materials are in metric. Industrial arts teachers have been introducing metric measurements and purchasing necessary equipment since Canada's conversion to the SI system.

EVALUATION

Evaluation is part of the education process and is necessary to determine whether the objectives have been met. It should assess various abilities, knowledge, and progress towards some objective(s). It should be considered as an ongoing, cooperative process of making judgments based on documented past and present experiences, with the aim of influencing the direction of future learning experiences.

The areas of study and modules emphasize both the practical aspects of skill mastery and the principles associated with the theories in industrial arts. Students should be involved in evaluating their progress, in determining objectives for the areas of study and the modules, and in selecting methods of evaluation.

PROCESS OF EVALUATION

The purposes of evaluation in a given situation vary according to the needs at the time:

- assessing the attainment of an objective;
- measuring various aspects of learning, such as knowledge, values, and manual skills;
- discovering what students already know;

- motivating students to learn;
- providing information for guidance and counselling;
- providing a basis for curriculum change.

Stating objectives is the first and most important step in the evaluation process. They can be stated in a variety of ways and can provide for cognitive, affective, and psychomotor outcomes at all levels, from simple to complex. The interrelationships among these three domains are evident. Seldom does a learning situation involve only one, and often there are situations which involve all three.

Cognitive objectives should include all six cognitive levels. Affective objectives should help students become aware of their own values and appreciate the need for tolerance of the values of others. Psychomotor objectives should stress the process of learning rather than the product.

Objectives are most effective in evaluation when they are:

- stated in terms of desired student learning outcomes;
- consistent with the structure of the subject matter;
- realistic in terms of students' abilities;
- related to learning principles;
- respective of the needs of the learners.

EVALUATION TECHNIQUES AND METHODS

The following points apply to all evaluation techniques and methods:

- The choice of evaluation procedure will reflect the purposes for which results will be used.
- The greater the variety of evaluation techniques used,

the more probable is a fair judgment.
- Motivation and achievement are affected by the type of evaluation method chosen.
- The intent of an objective and the method used to evaluate should be related.
- To be sound, the procedure selected must measure the content it is chosen to measure.
- The type of subject matter taught affects the choice of evaluation techniques.
- Attitudes are more likely to be positive if students participate in determining objectives, selecting means of evaluation, and evaluating their own progress.
- When learners can use self-evaluation techniques, they are better able to identify their own needs and to take initiative in learning.
- The effectiveness of evaluation techniques is affected by the balance among validity, reliability, usability, and the evaluation techniques selected.

Evaluation techniques may be classified as:

1. Real life situations:
    - observational techniques;
    - peer appraisal and self-report techniques.
2. Simulation techniques.
3. Laboratory management and techniques.
4. Projects. When ranking, quality is important but the time taken to complete the project must also be considered. The project should show evidence of an appreciation of the dignity of craftsmanship and a pride in the high level of achievement.
5. Tests. Tests provide some type of educational feedback that other techniques cannot provide. They include written tests, oral tests, performance tests, and written exercises.

STUDENTS WITH SPECIAL NEEDS

Both gifted students and those with special handicaps may benefit from study in the industrial arts program. Teaching these students successfully requires a sound knowledge of their characteristics and of effective ways of teaching them, and a desire to release the potential of these students for satisfying living.

Special needs may be categorized as:

- Physical - deafness/hearing impairment, blindness/visual impairment, orthopedic hadicap, general health impairment.
- Cultural - language and experiential background effects.
- Emotional - ranging from mental illness (severe) to interpersonal relationship problems (less severe).
- Intellectual - general cognitive ability, with particular reference to conceptualization and abstraction.

Administrators and teachers have identified the following five areas of educational needs for special students (the degree of need varies according to the individual):

1. socialization skills;
2. positive self-concept development;
3. daily living activities experiences;
4. independence;
5. employability and occupational skill development.

STRATEGIES TO DEVELOP AN APPROPRIATE PROGRAM

- Be as well informed about students as possible.

. Be aware of impact of various family lifestyles.

. Aply teaching strategies and materials consonant with the students' learning strengths and weaknesses, and cognitive functioning abilities.

. Some teaching strategies are applicable for all learners, regardless of ability; e.g., reinforcement and encouragement, simple clear directions, use of examples, and fostering a caring relationship.

. All students, regardless of handicap, need to learn to read, write, compute, make decisions and solve problems.

. Each student with a special need presents a unique challenge to the teacher to develop basic concepts and skills for that individual to proceed independently to the level of his/her ability.

. Some adaptation of the industrial arts facility and special equipment may be necessary for convenient and safe use of equipment and space. An enriched program may require additional materials and laboratory equipment.

. Essential content and skills are necessary for the handicapped student to master, as well as for everyone else.

. Instruction for the handicapped should be as systematic as possible.

. Content and/or skills should be broken down into small, discrete segments, then linked together in a logical, organized sequence. Sometimes, the teacher needs to decrease the degree of content and/or increase the number of examples to aid the low-ability learner.

. Constant reinforcement is important. Retention problems are reduced if strategies include careful task analysis, hands-on experiences, tactile demonstrations, and recognition of individual differences and needs.

. Encourage the optimal development of the gifted students by enriching the program, employing unusual and challenging teaching and motivational devices, and encourageing students to maintain established high levels of achievement.

. All students should be encouraged to experiment, innovate, search, test, and observe.

. The instructional approach should stimulate students' range of knowledge, skills, and their desire for expanding creative abilities, and provide opportunities to work independently, assume responsibility, and develop leadership abilities.

construction

CORE MODULES: Student Orientation, Safety, Careers, Measurement, Planning and Design, Consumerism, Site Selection, Materials, Separation, Fastening, Footings and Foundations, Floors, Walls and Partitions, Roofs, Enclosing, Energy and Insulation

OPTION MODULES: Exterior Finish, Interior Finish and Trim, Plumbing System, Electricity, Landscaping

I. STUDENT ORIENTATION (C.)

Estimated Time: 3 hours

MAJOR OBJECTIVE: To explore the significance of industrial arts in relation to the needs of individuals, industry, and society.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Integrate and emphasize this topic throughout all areas of study. Have students prepare and maintain a three-ring notebook relevant to their studies in industrial arts as an ongoing project. Discuss the purpose of maintaining a well-organized notebook. Encourage students to include the following in the notebook project: notes, sketches, illustrations, diagrams, articles from newspapers and technical periodicals, handouts, and instruction sheets.	PURPOSE OF NOTEBOOK PROJECT 1. To provide a record of learning and progress 2. To develop a store of reference information
A. PROGRAM OVERVIEW The student should be able to:		
1. define Industrial Arts;	Have students locate, discuss, and compare definitions for industrial arts. Ask them to formulate their own definition. (This definition, along with all others generated by this area of study, can be included in the vocabulary section of student notebooks.)	INDUSTRIAL ARTS: A phase of general education that serves to familiarize students with the tools, products, processes, and occupations of industry, as well as with the social and economic phenomena of the technological world in which they live and work

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Emphasize that industrial arts is an educational program pertinent to a body of related subject matter or courses, organized for the development of understanding about technical, consumer, occupational, recreational, organization, managerial, social, historical, cultural, and technological aspects of industry; industrial arts activities include experimenting, designing, constructing, and evaluating, providing individuals with opportunities to participate in creative and problem-solving processes that aid in making informed and meaningful occupational choices.	OR A curriculum area that includes phases of general education which deal with technology--its evolution, utilization, and significance; with industry--its organization, materials, occupations, processes, and products; and with the problems and benefits resulting from the technological and industrial nature of society
2. develop an understanding of the role of industrial arts;	Discuss the role of industrial arts in the general education of students. Relate the discussion to the definition and program goals of industrial arts. Make the students aware of goals common to all levels of industrial arts throughout the discussion.	Industrial Arts 7-9, Manitoba Department of Education GOALS COMMON TO ALL LEVELS OF INDUSTRIAL ARTS 1. Development of an understanding of industry and its place in our culture 2. Discovery and development of industrial talents, aptitudes, and interests related to pursuits and applied sciences 3. Development of an understanding of industrial processes and the practical application of scientific principles

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		4. Development of basic skills in the proper use of common industrial tools, machines, and processes 5. Development of problem-solving and creative abilities involving materials, processes, and products of industry
3. recognize the relationship between junior high school and senior high school industrial arts;	Describe the relationship between the junior high and secondary school programs for industrial arts. Have students refer to the goals common to all levels of industrial arts and collect information and prepare bulletin board displays, charts, or reports about both levels of programs.	Curriculum guides for senior high school programs in industrial arts
4. collect information about the avocational and vocational activities and interests in industrial arts.	Explain the terms avocation and vocation. Discuss the relationship and the difference between avocational and vocational activities pertinent to industrial arts. Emphasize that laboratory activities and projects develop knowledge and skills useful in attaining both the avocational and vocational goals of industrial arts. Make students aware of the recreational aspects of industrial arts. Provide information about the basic processes of various types of industries so that students may be more competent to choose vocations. Have students prepare collages, displays, charts, brochures,	AVOCATION: An activity, usually enjoyable, additional to regular work or profession VOCATION: A regular occupation or profession, usually requiring special talents or qualifications

<table>
<tr><th>TOPICS AND OBJECTIVES</th><th>SUGGESTED ACTIVITIES AND NOTES</th><th>RESOURCES</th></tr>
<tr><td></td><td>or reports about the avocational aspects of industrial arts.</td><td></td></tr>
<tr><td>B. JUNIOR HIGH SCHOOL INDUSTRIAL ARTS
The student should be able to:</td><td></td><td></td></tr>
<tr><td>1. list the subject clusters for junior high school industrial arts;</td><td>Make students aware of the subject clusters in the industrial arts program for Manitoba's junior high schools. Provide information about each of the subject clusters.</td><td>SUBJECT CLUSTERS FOR INDUSTRIAL ARTS IN JUNIOR HIGH SCHOOL
1. Construction
2. Graphic Communications
3. Power/Energy
4. Manufacturing</td></tr>
<tr><td>2. identify the areas of study for each of the subject clusters;</td><td>Point out the areas of study pertinent to each of the subject clusters. Have students collect information and prepare diagrams, charts, and posters about the relationship between the areas of study and the subject clusters. Have students prepare illustrated reports/brochures discussing some of the industrial processes and technological developmelnts for each of the areas of study.</td><td><table>
<tr><th>SUBJECT CLUSTERS</th><th>AREAS OF STUDY</th></tr>
<tr><td>1. Construction</td><td>Construction</td></tr>
<tr><td>2. Graphic Communications</td><td>Drafting
Graphic Arts
Graphic Communications</td></tr>
<tr><td>3. Power/Energy</td><td>Electricity/Electronics
Power Mechanics
Power/Energy</td></tr>
<tr><td>4. Manufacturing</td><td>Metalwork
Plastics
Woodwork
Manufacturing</td></tr>
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TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. recognize the modules for each area of study;	Prepare transparencies, charts, brochures, and/or handbooks to provide students with information about the various modules in each of the areas of study. Have students discuss the correlation of the modules to the areas of study and the subject clusters.	Industrial Arts 7-9, Manitoba Department of Education
4. identify the industrial arts program in local school division/school(s).	Discuss with students the industrial arts subject clusters and areas of study available in the school division and school. Take students on a tour of the laboratory/laboratories and provide them with handouts describing the program.	Industrial arts laboratory/laboratories
C. RESOURCE MATERIALS		
	Integrate instruction about the use and care of reference materials throughout the industrial arts program.	
The student should be able to:		
1. identify reference materials;	Prepare a display of reference materials related to industrial arts, or ask the librarian to do this. Explain or have the librarian explain the materials.	REFERENCE MATERIALS 1. Catalogues 2. Service manuals 3. Directories (city, telephone, trade) 4. Machine equipment and tool manuals 5. Textbooks 6. Periodicals 7. Audio-visual materials

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
2. develop the ability to use reference materials;	Provide students with opportunities to use reference materials for technical research, report writing, problem solving, and projects.	
3. identify community resources.	Have students assist in compiling lists of industries, speakers, and other community resources that are available for the enhancement of teaching/learning strategies for industrial arts.	Lists of industries, speakers, and other community resources

II. SAFETY (C)

Estimated Time: 4 hours

MAJOR OBJECTIVE: To develop safety consciousness in the use of tools and equipment, through a wide range of exploratory experiences related to individuals and to production and servicing aspects of hobbies and industries.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Integrate and emphasize safety instruction and practice throughout all areas of study in the industrial arts program. Provide a continuous safety program related to each area of study.	
A. SAFETY AWARENESS The student should be able to:		
1. understand the importance of safety;	Discuss the contribution of knowledge, skills, and positive attitudes to safe living and working conditions in homes, schools, and communities.	If I Had a Hammer (16 mm colour film), Manitoba Department of Education On Guard (colour filmstrip, cassette, program guide), Prentice-Hall
2. identify and follow behaviour conducive to safety;	Discuss the importance of behaviour in relation to safety and safe practices. Develop with the class a set of rules for behaviour. Make students aware of reasons for and advantages of each rule. Have them prepare posters, charts, and/or transparencies of the rules. Observe students, emphasizing that each has a responsibility not only to self but to the class/group for safe behaviour at all times.	Tips For New Employees (slides), available from Workplace Safety and Health Division, Suite 1000, 330 St. Mary Avenue, Winnipeg R3C 3Z5

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. identify and explain symbols denoting hazards;	Show students the various symbols denoting hazards: fire, explosion, poison, and others. Encourage them to study charts and posters about safety hazards and their symbols.	The Safety Program (colour filmstrip, cassette, program guide), Prentice-Hall General Shop Safety (colour, sound filmstrip), Vocational Filmstrip Company
4. accept responsibility for developing safety habits;	Make students aware that they are responsible for safety. Emphasize that safety in home, classroom, industrial arts laboratory, school, and community means protecting oneself and others from possible injury and danger. Explain and demonstrate the ABC of safety: Always Be Careful! Remind students frequently about the need to be safety conscious by integrating safety instruction throughout the areas of study in the program.	Safety/Health Guide for Industrial Arts, Vocational Industrial, Home Economics, and Business Education, Manitoba Department of Education The Workplace Safety and Health Act, Manitoba Statutes, Queen's Printer Safety Attitudes (slides), available from Workplace Safety and Health Division
5. explain the causes and effects of common industrial accidents.	Discuss the relationship between causes and effects of accidents. Assign readings from reference materials, periodicals, and daily newspapers for class discussion on industrial accidents. Invite guest speakers to speak on accidents and their prevention. Explain the relationship between the safety requirements of the industrial arts laboratory and those of industry.	Everything to Lose, The Split Second, (16 mm colour films), available from the Workplace Safety and Health Division Occupational Health and Safety: A Training Manual, Copp Clark Pitman It's Happened Before (16 mm colour film), Film Library, Manitoba Hydro
B. ORGANIZATION OF LABORATORY The student should be able to:		

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
1. demonstrate a knowledge of the organization of the industrial arts laboratory;	Take students on a tour of the industrial arts laboratory/laboratories and emphasize the importance of and the relationship among safety, cleanliness, and organization. Encourage students to study safety charts, posters, and signs placed around the laboratory/laboratories. Have them locate fire extinguishers, first-aid kits, telephones, and fire exits.	Industrial arts laboratories Student work stations Safety charts, posters, signs Setting Up Shop Safety Lectures (program), Workplace Safety and Health Division
2. recognize the relationship of laboratory layout to safety;	Make students aware that the laboratories provide an environment for the development of safety concepts and safe habits that will help guide the actions of the individual in all life situations. Discuss the layout of each laboratory with students. Have them prepare a list of limitations and unsafe conditions in the layout of each laboratory and suggest methods and procedures to follow in overcoming these. Emphasize the importance of orderliness and safety in each laboratory. Point out areas where accidents may happen.	Confined Space Hazards (16 mm colour film), available from the Workplace Safety and Health Division
3. recognize the potential hazards inherent to tools, equipment, machines, and materials;	Show students the difference between the incorrect and correct way to use and handle tools, equipment, machines, and materials. Emphasize and have them practice correct usage and handling techniques. Make students aware of how accidents may occur and how to avoid them.	Using Hand and Bench Tools, Operating Power Machines (colour filmstrips, cassettes, program guide), Prentice-Hall Hand Tool Safety, Power Equipment Safety, Hand Held Power Tool Safety, Radial Arm and Band Saw Safety (colour filmstrips, cassettes), AIM Educational Aids

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
4. explain the purpose of proper storage of tools, equipment, and materials.	Identify and discuss the storage areas requisite for various types of tools, equipment, and materials. Point out why proper storage areas are essential for safety in each laboratory.	
C. CLOTHING AND PROTECTIVE DEVICES The student should be able to:		
1. explain the importance of safe clothing;	Make students aware of the relationship of clothing to the work being done and to safety in each laboratory. Have students, individually or in groups, prepare displays, charts, and posters about safe clothing requisite for each area of study.	Bulletin board displays, charts, posters
2. wear clothing appropriate for industrial arts laboratories;	Have students examine and demonstrate the use of clothing appropriate to each industrial arts laboratory. Point out the hazards associated with loose clothing, neckties, jewellery, long hair, and long sleeves. Demonstrate methods of overcoming these hazards.	Your Feet Are Your Fortune (slides), available from the Workplace Safety and Health Division Introduction to Woodshop/Carpentry Safety (colour filmstrips, cassettes), AIM Educational Aids
3. understand the importance of protective devices;	Explain the purpose of various types of protective devices. Discuss and demonstrate the importance and	PROTECTIVE DEVICES 1. Gloves 2. Safety glasses, goggles, face shields

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	methods of sanitizing protective devices such as safety glasses, protective hearing devices, and respirators.	3. Repirators 4. Hard hats 5. Hearing devices (ear plug, ear muff) 6. Footwear 7. Safety straps 8. Hair bands/nets 9. Machine guards 10. Aprons 11. Welding jackets
4. use protective devices when required.	Demonstrate the proper use of protective devices. Insist that students use protective devices when needed. Use transparencies, slides, photographs, and films to show the correct use of protective devices. Use safety posters near machines and equipment.	Protecting Your Eyes (colour filmstrip, cassette, program guide), Prentice-Hall The Sound of Sounds, We'll See Tomorrow (16 mm colour films), and Guard Your Sight (slides), available from the Workplace Safety and Health Division
D. PROCEDURES The student should be able to:		
1. describe daily procedures to be followed in industrial arts laboratories;	Identify and discuss the daily procedures for industrial arts laboratories. Have students list, and follow daily procedures. Make them aware of the advantages and relationship of well-organized daily procedures to safety.	

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
2. identify and accept responsibility for housekeeping practices;	Point out that good housekeeping practices aid in the prevention of accidents as well as the establishment of a pleasant, well-organized environment for work and learning. Have students accept responsibility for the following daily housekeeping activities: - removal of all waste materials; - maintenance of safety zones to maintain required aisle space and working space around machines; - clean-up of shop equipment and floors at the end of each period; - reporting of unsafe tools, equipment, and machines.	Housekeeping Means Safekeeping (16 mm colour film), and Keep It Clean for Safety's Sake (slides), available from the Workplace Safety and Health Division
3. identify emergency procedures;	Make students aware of emergency procedures related to fire, first-aid, and accidents.	The A, B, C's and D's of Portable Fire Extinguishers (16 mm colour film), Film Library, Manitoba Hydro
4. practice and use emergency procedures.	Review and practice emergency procedures for leaving the laboratory. Discuss location and use of emergency equipment such as fire extinguishers and panic buttons. Explain the importance of an easily accessible, properly maintained and marked, first-aid kit. Emphasize that emergency first-aid only should be given to serious injuries, which should then be treated by qualified medical personnel.	Preparing for Emergencies; Wounds, Sprains, Fractues; Shock, Fainting, Burns; Artificial Respiration (colour filmstrips, cassettes, program guide), Prentice-Hall

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Establish a procedure for reporting all accidents, no matter how trivial. Explain the purpose and the use of accident report forms. Have students complete accident report forms. Make them aware of benefits available under the Workers' Compensation Act.	Examples of accident report forms The Workers' Compensation Act, Manitoba Statutes, Queen's Printer

III. CAREERS (C)

Estimated Time: 4 hours

MAJOR OBJECTIVE: To gain information about the general occupational characteristics of a variety of career fields and to match interests, abilities, likes, dislikes, and values to characteristics of various careers.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Integrate and emphasize career instruction throughout all areas of study in the industrial arts program. Provide specific career information for each area of study.	
A. CAREER CLASSIFICATIONS The student should be able to:		
1. develop an awareness of the major groups of occupations;	Outline the major occupational groups. Discuss important points to consider in studying occupations. Use assignment sheets based on The Canadian Classification and Dictionary of Occupations.	The Canadian Classification and Dictionary of Occupations, Department of Manpower and Immigration, Canada
2. collect informaton about careers related to the major groups of occupations;	Encourage students to begin preparing well-organized and well-indexed career folders to cover intensive studies of various careers. Point out the relationship between careers in major groups of occupations and the eleven areas of study in the industrial arts program.	Training Manual for Canadian Classification and Dictionary of Occupations, Volume I, Department of Manpower and Immigration, Canada Industrial Arts 7-9, Manitoba Department of Education

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TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. identify careers related to the areas of study in the industrial arts program.	Have students discuss and prepare charts, posters, and/or reports for career folders showing the relationship between possible career choices and the areas of study. Organize the instructional program so that the kinds of jobs related to activities in each area of study are clearly identified. Implement a career information centre or corner in the laboratory. Have students assist with the organization and sponsorship of a career fair in the laboratory, school, and/or community shopping centre. Require students to select three possible occupations and show the training requirements for each.	Aircraft Mechanic, Architectural Drafting, Career of an Auto Mechanic, A Career in Cabinet Making, Careers in Graphic Arts: Silkscreening, The Electrician Kit, The Machinist in the Plastic Moulding Industry, Sheet Metal Working Is . . . (colour slides, audio cassettes, carousel slide trays), available from Department of Education Library, 1181 Portage Avenue, Winnipeg, Manitoba R3G 0T3
B. SKILLS AND APTITUDES The student should be able to:		
1. develop an awareness of skills and aptitudes required for the major groups of occupations;	Review the many types of careers pertinent to the major groups of occupations in Canada. Have students locate similar information for the major groups of occupations in Manitoba. Ask students to prepare lists/maps of locations of local industries/businesses and to identify the major occupations related to these. Have students develop a classroom file of occupations available locally. Discuss the relation-	The Canadian Classification and Dictionary of Occupations, Department of Manpower and Immigration, Canada Canada Year Book and Canada Handbook, Statistics Canada Careers Manitoba, Volumes 1, 2, 3, 4, Employment and Immigration, Canada

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	ship of industrial arts to the various types of occupations.	The Manitoba Career Guide, Manitoba Department of Education Manitoba Trade Directory, Sanford Evans Publishing Telephone and city directories Newspapers
2. identify skills required for specific jobs;	Provide students with information on job titles and descriptions to illustrate the various types available. Have students research job descriptions for specific jobs of their choice. Have students identify the skills requisite for their chosen jobs.	The Canadian Classification and Dictionary of Occupations, Department of Manpower and Immigration, Canada
	Provide students with a list of educational and training programs related to major occupational areas and specific jobs. Have them prepare charts, posters, and/or reports on the educational requirements for the job(s) being investigated.	Textbooks for each of the areas of study in industrial arts
3. identify personal interests, abilities, and needs;	Have students analyze personal interests and abilities by completing a self-assessment inventory at the beginning of the first year and at the end of the final year in the industrial arts program. Have students include the following in the self-assessment inventory: interests, skills, likes, dislikes, goals, etc. Point out that each individual wishes to fulfill certain needs and hopes and to achieve certain goals	Self-assessment inventory forms

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	from a job. Have students identify and rank the ten most common needs and hopes related to jobs. Encourage them to discuss the ranking of the needs and hopes.	
	Emphasize that in order to make decisions about future careers, students should keep up-to-date, complete information about personal abilities, interests, hopes, and achievements as well as current information about many jobs.	Careers, Reed Career Service (bi-monthly) Current job information The Index to Canadian Occupations (kit), Canadian Government Publishing Centre
	Have students compare personal information with information discovered about jobs. Indicate that this process will assist students in making appropriate career decisions. Point out that self-evaluation of interests and abilities provides the foundation for personal career planning.	
4. recognize the relationship of attitudes to working conditions;	Have students identify and discuss the attitudes that help people achieve on the job. Point out that regardless of future employment, students will be expected to work with others in a variety of situations. Explain the importance of good manners, cheerfulness, and punctuality. Emphasize pride in work, self-worth, safety consciousness, regular attendance, cooperation, industriousness, and friendliness. Have students prepare charts, posters, and/or reports on indicators of good attitudes. Use case problems, in-class decision-making exercises, and out-of-class group projects to help students develop human-relation skills.	INDICATORS OF A GOOD ATTITUDE 1. Punctuality 2. Attendance 3. Neatness 4. Honesty 5. Cooperation 6. Friendliness 7. Industriousness 8. Composure 9. Other

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
5. identify realistic educational and training plans for specific occupational areas;	Review skills required for specific jobs; personal interests, abilities, and needs; and the comparison of personal information with information discovered about jobs. Have students match personal credentials with educational and vocational opportunities and requirements by completing an occupational analysis form. Relate the occupational analysis to the areas of study in the industrial arts program. Point out that completion of an occupational analysis form for each job studied will provide important clues about future vocational goals and assist with the selection of a high school program of studies.	Creating a Career Program, Canadian Government Publishing Centre Occupational analysis forms REED CAREER SERVICE VIDEOTAPE CAREER AWARENESS RESOURCE LIBRARY, Library, Manitoba Department of Education Carpentry B-2 Chemical and Plastics Processing F-1 Concrete Finishing B-3 Drafting 0-4 Electrical and Electronic Engineering A-8 Electrical Power, Lighting and Wire Communications B-4 Electronic Products Manufacturing G-6 General Manufacturing G-8 Graphic Arts 0-6 Insulating and Roofing Occupations B-6 Mechanics 0-9 Metal Machining G-11 Metal Products F-4 Metal Shaping and Forming G-12 Photography D-5 Photographic Processing 0-13 Plastering, Painting and Paper Hanging B-8 Printing 0-14 Rubber and Plastic Products Manufacturing G-14 Sheet Metalwork G-15 Wood Processing F-9 Wood Products Manufacturing G-19

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
6. recognize the impact of technology on careers;	Discuss the influence of technology on employment trends, life styles, and speed of change. Point out the changes in jobs and roles of employees. Make students aware of the relationship between technological developments and career preparation and the importance of planning for contingencies. Have students assess the extent to which technological change may downgrade or upgrade a given occupation by affecting the employment opportunities and occupational requirements.	The Thinking ?? Machine, Incredible Machine (films), Manitoba Telephone System, Public Relations Department Humanized Technology (video recording and viewer's guide), Fast Forward Series I Implications (video recording and viewer's guide), Fast Forward Series 2
7. explain the influence of social and economic trends on careers.	Identify and discuss social and economic trends and their effects on social and economic aspects of various occupations. Ask students to assess the future social and economic status of a given occupation. Have them identify job alternatives (similar in required training and experience) that could be chosen in the event that technological change eliminates a given occupation.	Newspapers Radio and television news
C. JOB-SEARCH TECHNIQUES		
The student should be able to:		
1. identify the ways in which jobs are advertised;	Discuss methods used to advertise jobs. Have students collect and discuss examples of job advertisements and prepare charts, posters, and/or bulletin board displays.	JOB ADVERTISEMENT SOURCES 1. School guidance counsellors 2. Canada Manpower 3. Employment agencies 4. Newspapers, periodicals

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
2. understand the purposes of a job description;	Obtain or write job descriptions. Have students examine and assess the advantages and disadvantages of job descriptions. Ask them to list the purposes of job descriptions.	PURPOSES OF JOB DESCRIPTIONS 1. Outline duties 2. Describe routines 3. Assign responsibility 4. Delegate authority 5. Delimit accountability 6. Prevent conflicts 7. Describe ability requirements 8. Categorize personnel 9. List expected skills and attitudes 10. State desired education
3. explain the need for a resumé, an application, and an interview.	Have students collect examples of resumés, letters of application, and application forms. Have them explain the purposes of and compare the format and the content of resumés, letters of application, and application forms. Point out that application forms and resumés often contain similar information. Ask students to write a resumé and a letter of application and to complete an application form for a specific job description or advertisement. Discuss interview processes and techniques. Emphasize that students will be expected to communicate in all career situations. Make students aware that good communication	Resumés Letters of application Application forms

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	starts with the application form and the interview and continues with company/business reports and interaction with customers and co-workers. Point out the importance of basic reading, writing, speaking, and computing skills, and assist students to develop these in all class activities.	

IV. MEASUREMENT (C.) Estimated Time: 4 hours

MAJOR OBJECTIVE: To gain knowledge and skills related to imperial and SI metric systems of measurement, measuring devices, and testing devices.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Integrate and emphasize instruction, practice, and applications of measurement throughout each module in the construction area of study.	
A. UNITS OF MEASUREMENTS The student should be able to:		
1. define measurement;	Have students discuss and define measurement. Emphasize that measurement is a method used to communicate information about size, shape, distance, and weight. Have students give examples of construction measurements related to size, shape, distance, and weight. Make them aware that measurement is made by comparing an unknown quantity with a standard or known quantity.	MEASUREMENT: A method of communicating size, shape, distance, and weight
2. explain the need for measurement;	Make students aware of the relationship between good workmanship and accurate measurements. Have students identify ways in which measurement applies to various aspects of construction.	

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. identify the basic types of quantity measurement;	Identify and discuss the basic kinds of quantity measurement. Have students prepare charts, posters, bulletin board displays, and/or illustrated reports about the basic types of quantity measurement.	BASIC TYPES OF QUANTITY MEASUREMENT 1. Length 2. Mass 3. Time 4. Temperature 5. Electric current 6. Amount of a substance 7. Light intensity
4. list and give application examples of SI metric and imperial units of measurement used in construction.	Explain and have students identify SI metric units and imperial units of measurement used in various construction activities. Have students prepare charts in notebooks for display to identify SI metric and imperial units of measurement - and their applications in the construction industry. Emphasize the following:	World of Construction, 5th ed., McKnight Publishing, Reading 15 Construction Materials, Methods, Careers, Goodheart-Willcox, Useful Information Building Construction Technology, SI Metric, McGraw-Hill Ryerson, Introduction, Chapter 1 Exploring Construction Industry, McKnight Publishing, Apendix, pp. 569-576

UNITS OF MEASURE

QUANTITIES	SI METRIC UNITS	IMPERIAL UNITS	APPLICATIONS
Length, distance	metre	yard	Linear measurements
		foot, inch	Length and width of building
	millimetre	foot, inch	Thickness, width, and length of lumber and panel material
			Layout work and measurements in respect to constructing parts of a building

<table>
<tr><th>TOPICS AND OBJECTIVES</th><th>SUGGESTED ACTIVITIES AND NOTES</th><th>RESOURCES</th></tr>
<tr><td></td><td>
<table>
<tr><th>QUANTITIES</th><th>SI METRIC UNITS</th><th>IMPERIAL UNITS</th><th>APPLICATIONS</th></tr>
<tr><td>Area</td><td>square metre</td><td>square yard, foot, inch</td><td>Area of building site
Area of building
Exterior and interior wall and roof sheeting</td></tr>
<tr><td></td><td>hectare</td><td>acre</td><td>Area of building sites together</td></tr>
<tr><td>Volume</td><td>cubic metre</td><td>cubic yard
cubic foot
board foot</td><td>Large volumes of dimensional lumber and panel materials
Volume of excavated materials
Volume of gravel, concrete, fill materials</td></tr>
<tr><td></td><td>litre</td><td>gallon</td><td>Amount of water used in cement - water ratio of a concrete mix</td></tr>
<tr><td>Mass/Weight</td><td>kilogram</td><td>pound</td><td>Quantity unit of bagged or bulk cement</td></tr>
<tr><td>Temperature</td><td>degrees Celsius</td><td>degrees Fahrenheit</td><td>Energy conservation</td></tr>
</table>
</td><td></td></tr>
<tr><td>B. MEASURING DEVICES
The student should be able to:
1. identify common measuring tools;</td><td>Acquaint students with common measuring tools.</td><td>COMMON MEASURING TOOLS
1. Rules
2. Tapes</td></tr>
</table>

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		3. Squares 4. Balance scales 5. Thermometers
2. use common measuring tools to measure the following quantities: length, area, volume, mass, temperature.	Demonstrate and have students use rules, measuring tapes, squares, balance scales, and thermometers to measure various quantities of length, area, volume, mass, and temperature.	Building Construction Materials and Methods, rev. metric ed., Gage Publishing, Chapter 5 Introduction to Woodworking and Construction, rev. ed., McGraw-Hill Ryerson, Chapter 3
C. TESTING DEVICES The student should be able to:		
1. identify common devices to test vertical and horizontal levels and elevations;	Define and discuss the purpose of the chalk line, plumb bob, line level, and builder's level. Point out the importance of checking/testing materials and/or sections of structures to determine if they are straight, level, and plumb. Explain that to level means to check or adjust the horizontal level of an object. Explain that to plumb means to check the right angle of a vertical surface to the horizontal or level surface.	TESTING DEVICES 1. Chalk line 2. Plumb bob 3. Line/spirit level 4. Builder's level 5. Transit level CHALK LINE: Device consisting of lines in rolls or spools used for laying out building or foundation lines, straight lines on subfloors, shingles or roof sheathing, and for other construction tasks.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		PLUMB BOB: Device used to establish vertical lines and to locate a point directly below an established point, line, or structural member LINE/SPIRIT LEVEL: Devices used to plumb and level structural members
	Discuss the purposes of builder's and transit levels. Make students aware of the importance of the transit level for laying out both lot and building simultaneously.	BUILDER'S LEVEL: Device used for testing level, transferring points, and measuring angles on a horizontal plane TRANSIT LEVEL: Instrument used for establishing building lines and determining accurate levels and elevations
2. use testing devices.	Demonstrate the use of and have students use chalk lines, plumb bobs, line/spirit levels, builder's levels, and transit levels. Explain elevations and show students how to use builder's and transit levels to measure different elevations.	Building Construction Materials and Methods, rev. metric ed., Gage Publishing, Chapter 5 Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapters 1 and 4

V. PLANNING AND DESIGN (C.)

Estimated Time: 6 hours

MAJOR OBJECTIVE: To gain an understanding of and to develop skills in planning, design, and architectural drawings.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Integrate and emphasize planning and design throughout all modules in the construction area of study.	
A. PLANNING FOR CONSTRUCTION The student should be able to:		
1. develop an understanding of the importance of planning;	Point out in discussion that planning for various types of construction begins some time before the actual work on construction starts.	Managing Construction (filmstrip, cassette), McKnight Publishing
2. define planning;	Have students discuss and define planning. Point out that planning is one of the activities related to the managing of construction projects. Make students aware that planning involves two important resources, people and things.	PLANNING: The process of identifying and preparing details to be considered before construction begins World of Construction, 5th ed., McKnight Publishing, Reading 2
3. identify the components of planning;	Emphasize that planning for construction is a cooperative process, requiring many people to use resources and equipment effectively to meet the needs of society, business, and individuals. List	COMPONENTS OF PLANNING 1. Formulating 2. Researching 3. Designing

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TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	and define the components of planning. Make students aware of the need for short-term planning. Have students identify careers, materials, and equipment related to each of the components of planning.	4. Engineering FORMULATING: The process of deciding what to build to meet needs RESEARCHING: The process of gathering facts to assist with decision-making DESIGNING: The process of developing and creating a plan ENGINEERING: The process of adding details to design and of scheduling construction
B. DESIGN The student should be able to:		
1. recognize the fundamentals of design;	Review the definition of designing. Provide students with information about these fundamentals of design: balance, proportion, emphasis, and harmony. Make them aware of ways in which these fundamentals apply to construction. Show students examples of or have them collect illustrations of various types and styles of construction which illustrate each of the design fundamentals. Have groups of students develop posters, displays, and/or illustrated reports about each of the design fundamentals.	Illustrations of various types and styles of construction

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
2. describe the factors to be considered in the design process;	Make students aware of the affect of these factors on the design process: strength, function, appearance, construction materials, cost, and harmony with community needs. Point out that these factors are common to all construction designs and are closely related.	The Architect at Work (filmstrip, cassette), McKnight Publishing
3. identify the steps in the design process.	Provide students with information about the following steps in the design process: - identifying problems, - creating preliminary ideas, - refining ideas, - analyzing solutions, - selecting or deciding on a design, - implementing. Make students aware of the relationship of each of the steps in the design process to various types, styles, and sizes of construction.	World of Construction, 5th ed., McKnight Publishing, Readings 8, 9, 10, 11, 12, 13, 14
C. ARCHITECTURAL DRAWINGS/ BLUEPRINTS		
	Emphasize the relationship amongst architectural drawings/blueprints, planning for construction and construction procedures. Explain the importance of developing the ability to read, understand, and interpret drawings and to use the information from the drawings during the construction process. Make students aware of the impact	World of Construction, 5th ed., McKnight Publishing, Readings 16, 17, 18

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	of computer technology on architectural drawings/blueprints.	
The student should be able to:		
1. define architectural drawing/blueprint;	Discuss and define architectural drawing/blueprint.	ARCHITECTURAL DRAWING/BLUEPRINT: A series of drawings containing information regarding construction
2. recognize types of architectural drawings/blueprints;	Explain and define the two types of architectural drawings. Have students collect examples of perspective drawings from periodicals, newspapers, company brochures, and other forms of advertisements and use these examples in the preparation of posters, displays or illustrated reports. Acquaint students with the following names for perspective drawings: presentation drawings, artistic presentations, perspective renderings, pictorial drawings.	Periodicals, newspapers, and company brochures PERSPECTIVE DRAWING: A drawing showing the finished exterior view of the construction project
	Show students examples of working drawings for various types of construction. Emphasize that sets of working drawings aid builders and other trades people in obtaining information which helps them to carry out tasks necessary to the construction project. Point out that working drawings provide step-by-step details of construction, from footings to roofs.	WORKING DRAWING: Plans drawn for construction consisting of plan views, elevation views, detailed views, sectional views, mechanical and electrical views Examples of working drawings

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. identify the types of working drawings;	Define and explain the purposes of each of the following types of working drawings: site/plot plan, plan views, foundation plan, floor plan, elevation views, sectional views, detail views, and mechanical details. Have students refer to a set of working drawings and/or transparencies of working drawings and identify the various types of working drawings. Make students aware of the relationship among the various types of working drawings.	Examples of sets of working drawings
4. recognize the language and symbols of architectural drawings;	Acquaint students with and have them locate different types of lines, symbols, scales, and schedules which appear on the working drawings.	Examples of types of lines, symbols, scales, and schedules
5. explain the purpose of construction specifications;	Define construction specifications. Show students an example of specifications and explain the relationship of specifications to the working drawings.	CONSTRUCTION SPECIFICATIONS: The written instructions for the builder containing specific information about materials and work required for a project.
6. recognize the importance of building codes;	Define building code. Point out that the regulations in the building code refer to public health, fire protection, and structural requirements and explain their relationship to planning for construction, design, and architectural drawings/blueprints. Make students aware of the National Building Code of Canada, provincial and local building requirements, local zoning by-laws, and the Canada Mortgage and Housing Corporation building codes.	BUILDING CODE: A set of minimum regulations related to safety of buildings National Building Code Residential Standards Canada Local zoning by-laws

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
7. read architectural drawings/blueprints;	Prepare questions related to various types of architectural drawings. Have students answer the questions by referring to the drawings.	Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chpater 3 Building Construction Materials and Methods, rev. metric ed., Gage Publishing, Chapters 2 and 3
8. identify basic drafting tools;	Explain the purpose of each of these basic drafting tools: drawing board, dividers, T-square, engineering scale, 45° triangle, drafting pencil.	BASIC DRAFTING TOOLS 1. Drawing board 2. Dividers 3. Drafting pencil 4. Engineering scale 5. 45° triangle 6. T-square
9. use basic drafting tools;	Demonstrate the use of and have students use basic drafting tools. Have students, individually or in groups of two, copy simple architectural drawings or prepare original architectural drawings for construction projects, sketch floor plans of a simple bungalow, and prepare dimension sketches of projects for other modules.	
10. use architectural drawings/blueprints.	Have students use an architectural drawing to construct a model of a design problem. Provide them with opportunities to build simple scale models from cardboard, plywood, balsawood, paper, and other materials.	

VI. CONSUMERISM (C.) Estimated Time: 2 hours

MAJOR OBJECTIVE: To explore the complexity of the economy in relation to consumer awareness and construction.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Integrate and emphasize instruction and applications of concepts from this module throughout the construction area of study.	
A. ECONOMIC SYSTEMS AND CONSTRUCTION The student should be able to:		
1. define economic system;	Explain the term economic system. Emphasize that the economic system refers to the following: . the way individual workers and managers, productive organizations such as factories or farms, and government agencies are linked together to form a system, a unit, or an organization. . the way decisions are made as to what the workers, productive organizations, and government agencies will do to determine answers to basic economic questions that each nation, province, and local community faces.	World of Construction, 5th ed., McKnight Publishing, Readings 1, 2, 3

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Discuss the basic economic questions. Point out how these questions relate to construction. Make students aware that political, social, religious, and moral systems influence economic systems and that economic systems change from one country to another and within a single country over a period of time. Point out that the various types of economic systems produce goods and services for consumers to purchase. Explain that the following economic activities provide consumers with products for goods and services: mining, manufacturing, and construction.	BASIC ECONOMIC QUESTIONS 1. What to produce? 2. How to produce it? 3. Who will receive the finished products? 4. How much to produce over a period of time?
2. explain the basic parts of economic systems;	Identify and discuss the basic parts required by economic systems to produce goods and services: inputs, processes, and outputs. Emphasize the following: a) Outputs are goods and services produced by an economic system. b) Processes are the work activities required to produce goods and services. c) Inputs are the resources required for the work activities to produce goods and services. Have students give examples of outputs, processes, and inputs for construction activities.	*Exploring the Construction Industry*, McKnight Publishing, Concept 2 *Managing Construction* (filmstrip and cassette), McKnight Publishing *World of Construction*, 5th ed., McKnight Publishing, Reading 1

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. identify basic types of inputs.	Review the definition of inputs. List and discuss the basic types of inputs. Emphasize that the basic inputs are common to various types of organizations such as schools, clubs, businesses, and families.	BASIC TYPES OF INPUTS 1. People 2. Knowledge and skills 3. Industrial resources 4. Utilities 5. Finance
B. CONSTRUCTION AND CONSUMERISM The student should be able to:		
1. identify human needs;	Make students aware of the importance of understanding the following human needs: physical, societal, intellectual, and emotional. Have students identify some of the basic physical, societal, intellectual, and emotional needs. Point out the relationship between these needs and construction. Refer to Maslow's pyramid of human needs. Relate these needs to housing/homes.	HUMAN NEEDS PRIORIZED BY MASLOW 1. Physical needs 2. Security 3. Love and acceptance 4. Esteem 5. Self-actualization Housing Decisions, Goodheart-Willcox, Chapter I
2. explain how construction meets human needs;	Emphasize that construction or various types of structures on sites are available in different societies and economic systems. Have students compile a list of, prepare a bulletin board display about, and/or write a report on five different forms of construction to explain society's need for each form.	Exploring the Construction Industry, McKnight Publishing, Concept I FORMS OF CONSTRUCTION 1. Roads 2. Bridges 3. Fences

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Point out that homes contribute to meeting these basic needs of individuals: shelter, food, water, and clothing.	4. Grain elevators 5. Stores 6. Dams 7. Homes 8. Hospitals 9. Schools 10. Utility lines and towers (telephone, hydro)
3. explain the relationship between construction and the economy.	Discuss the importance of construction to the national, provincial, regional, and local levels of economy. Have students investigate the effects of construction activities on the local economy in relation to employment and other business activities, including sales.	
C. CONSTRUCTION AND THE MARKET PLACE		
	Point out the importance of prospective home owners developing an understanding of the market place and its relationship to the economy.	
The student should be able to:		
1. recognize the concept of quality versus cost;	Discuss with students the following concepts: quality versus cost, supply and demand, the state of the economy, financing, and advertising.	World of Construction, 5th ed., McKnight Publishing, Reading 1
2. explain the role of supply and demand;	Make students aware of the relationship of	

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. describe the effects of inflation;	these various concepts in reference to construction, supply and demand, inflation, and credit buying:	
4. identify the positive and negative aspects of credit buying;	- planning and design; - human needs; - availability and use of resources; - employment; - availability and choice of real estate.	Buying and Selling Real Estate (filmstrip and ccassette), McKnight Publishing
5. explain the purpose and influence of advertising.	Define advertising. Discuss the influence of advertising on construction and real estate. Have students collect information about and examples of various types of advertising for displays and reports.	TYPES OF ADVERTISING MEDIA 1. Radio 2. Television 3. Newspapers 4. Periodicals 5. Signs 6. Direct mail 7. Computers

VII. SITE SELECTION (C)

Estimated Time: 4 hours

MAJOR OBJECTIVE: To explore site selection in relation to the successful erection of a building.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. SITE SELECTION The student should be able to:		
1. define site;	Point out in discussion that the site is a very important component for any type of construction project.	SITE: The place or plot of land where something was, is, or is to be located Building Construction Materials and Methods, rev. metric ed., Gage Publishing, Chapter 6
2. identify criteria for selecting a site;	Emphasize that criteria are standards or tests used for making a design and that sites for different types of construction will be judged by different criteria. Point out that cost, physical characteristics, restrictions, and utilities are chief concerns related to selecting a site for the construction of a home.	CRITERIA FOR SITE SELECTION 1. Usefulness 2. Labour supply 3. Market location 4. Environment 5. Transportation 6. Utilities 7. Climate 8. Physical characteristics 9. Land restrictions 10. Zoning laws Building Site, Labor and Materials, Legal Restrictions, and Building Layout (colour transparencies), Building Construction Series, AIM Educational Aids

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. explain the relationship of physical characteristics to site selection;	Discuss the following physical characteristics of sites: flatness, hardness, steepness, drainage, and conditions below ground. Have students research and discuss the effects of hills, swamps, sand, hardpan, and bed rock on building construction. Make students aware of the relationship of site selection to the following: sun, prevailing winds, soil, and natural and artificial topography (position of trees, shrubbery, and surrounding buildings). Discuss soil testing methods. Point out the importance of making a decision on the basis of energy conservation.	HARDPAN: A mixture of sandy gravel soils and clay, producing an extremely hard, compact soil. TOPOGRAPHY: The physical features of a place or region World of Construction, 5th ed., McKnight Publishing, Concept 6
4. recognize the need for utilities;	Ask students what utility systems are. Have them identify the importance of various utilities to constructing homes and other buildings. Ask students to research the availability of utilities in cities, towns, villages, and rural communities. Have them identify utility systems in their community. Have them discuss the effect of the non-availability of utility systems.	UTILITY SYSTEMS: The distribution networks and equipment that furnish a service such as water, sewage, electricity, gas, and communication
	Make students aware of these basic components of a utility system: source, transmission, control, and use. Have students define, give examples, and prepare posters and displays about these basic components.	SOURCE: The origin of the utility such as wells, generators TRANSMISSION: The method of carryng the utility such as pipes, ducts, wires
	Discuss the impact of technology on the source, transmission, control, and use of utilities.	CONTROL: The devices for controlling the utility such as switches, thermostats, transformers, computers

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		USE: The location of the use of utilities such as appliances and equipment in factories
5. recognize the need for land restrictions and zoning laws;	Point out that land restrictions assist in deciding which site to choose. Discuss the purpose of zoning laws. Obtain copies of local zoning laws and have students discuss these.	PURPOSE OF ZONING LAWS: To limit the kind of structures and activities in an area
6. describe the relationship between site selection and cost.	Have students determine the cost of land by researching newspapers and publications listing real estate. Explain that a site is obtained by negotiation and agreement between buyer and seller and by the completion of required legal documents.	Newspapers Publications about real estate
B. SURVEYING The student should be able to:		
1. explain the purpose of surveying;	Make students aware that surveying is used to locate or to describe a specific place on earth. Emphasize that surveying deals with elevation, distance, and angle. Discuss the relationship between surveying and construction.	Introduction to Surveying and Mapping (filmstrip and cassette), McKnight Publishing World of Construction, 5th ed., McKnight Publishing, Readings 5, 29
2. define elevation, distance, and angle;	Use illustrations to identify the purpose and to explain the relationship	Exploring the Construction Industry, McKnight Publishing, Concept 5

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	of elevation, distance, and angle to planning for construction. Emphasize the following: a) Elevation indicates how far above sea level a place is. b) Distance indicates how far one place is from another. c) Angle indicates direction.	
3. identify the methods for determining locations and elevations of building sites;	Describe tools and their use in surveying to determine elevation, distance, and angle in relation to building sites.	TOOLS 1. Tape measure 2. Hammer 3. Rod 4. Stakes 5. Transit level
4. read elevations and contours;	Show students topographical maps and have them identify the high and low areas. Have students work in pairs to read elevations and contours by means of a sand box and/or have them prepare a contour model.	Contour Model Map Kit, McKnight Publishing
5. use a transit level to measure elevations and locate building sites.	Refer to Testing Devices in the Measurement module to review the use of the transit level. Demonstrate the use of and have students use the transit level for measuring elevations and locating building sites. Give students elevations and profile views of proposed sites and have them locate the best position for the structure.	Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 4

VIII. MATERIALS (C)

Estimated Time: 2 hours

MAJOR OBJECTIVE: To gain knowledge of the basic types of home construction and the common building materials.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Integrate discussion of materials requisite for construction throughout Module V and Modules VIII to XXI.	
A. TYPES OF HOME CONSTRUCTION The student should be able to:		
1. identify basic house styles;	Discuss basic house styles. Arrange a field trip through a residential area and ask students to list different house styles and materials used in their construction. Have students work in groups to prepare bulletin board displays of basic house styles. Make them aware of the relationship between planning and design, materials and house styles. Have them sketch the four different house styles.	BASIC HOUSE STYLES 1. Single-story house 2. One and a half story house 3. Two-story house 4. Multi-level house
2. collect information about types of prefabricated houses;	Make students aware that prefabricated houses can be partially or wholly manufactured at a factory or assembly plant. Have students prepare posters and displays based on their research into styles of and materials for prefabricated houses.	TYPES OF PREFABRICATED HOUSES 1. Mobile house 2. Sectional house 3. Ready-to-move house 4. Packaged house

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 2 Rough Carpentry and Masonry, McGraw-Hill Ryerson, Chapter 1
3. recognize the relationship between energy conservation and house styles.	Explain the importance of energy conservation for each type of house style.	
B. TYPES OF BUILDING MATERIALS The student should be able to:		
1. identify classes of building materials;	Review the basic styles of houses and prefabricated houses. Have students prepare lists classifying building materials used in these dwellings. Point out the relationship of building materials to plan and design.	CATEGORIES OF BUILDING MATERIALS 1. Wood 2. Fibre 3. Plastics 4. Masonry materials 5. Metal
2. recognize the types of structural and finishing materials used in construction;	Discuss the various types of materials used in construction. Arrange field trips to building supply businesses, hardware stores, and building sites to acquaint students with the types and sizes of materials. Make them aware of the following materials:	Building Construction Materials and Methods, rev. metric ed., Gage Publishing, Chapter 4 Construction: Systems and Materials, Prentice-Hall, Units 5, 6

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	- Wood: mouldings of many shapes and sizes; sidings in a variety of shapes and widths; shingles, shakes; plywood sheets; - Fibre: fibreboards, hardboards, particleboards; - Plastics: counter tops; floor coverings; mouldings and interior trim; window sashes, doors, and frames for windows and doors; gutters and drainpipes; various plumbing, electrical, and hardware components; - Masonry Materials: concrete blocks and bricks; pre-cast panels and units; screen wall blocks; clay bricks; - Metal: beams, studs, joists, flashing, siding, windows, doors, finish, gutters and downspouts, nails and other types of fasteners. Point out the relationship of building materials to the specifications for architectural drawings. Have students collect advertisements and trade magazine articles about building materials in order to prepare displays, posters, and illustrated reports.	
3. describe the properties and uses of the various types of building materials.	Discuss and demonstrate the properties and uses of common building materials. Have students experiment with different materials; for example, have them compare the properties of two common woods, fir and spruce, and the holding power of various types of nails. Make students aware of the energy conservation properties of building materials.	Modern Carpentry, Goodheart-Willcox, Unit 4 Rough Carpentry and Masonry, McGraw-Hill Ryerson, Chapter 5

IX. SEPARATION (C.) Estimated Time: 8 hours

MAJOR OBJECTIVE: To obtain knowledge about and to develop skills in the use of hand and power tools applicable to the separation processes in construction.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	Integrate instruction and practice in the safe use of hand and power tools as applied to separation processes throughout the construction area of study.	
A. METHODS OF SEPARATION The student should be able to: 1. define separation;	Discuss and have the students define separation.	SEPARATION: The process of removing one or more components/parts/sections from a mass
2. identify methods of separation.	Have students list and define various methods of separating materials. Emphasize shearing, chipping, paring, and shaving. Point out the importance of safety precautions and procedures pertinent to each of these methods. Have students name the hand and power tools related to each of the separation processes.	

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
B. HAND TOOLS The student should be able to:		
1. identify common hand tools for shearing, chipping, paring, and shaving;	Show students hand tools commonly used in separation processes (show illustrations of these tools). Have students identify each tool by name. Give them the names of the separation processes and have them list hand tools used for each.	COMMON HAND TOOLS FOR SEPARATION PROCESSES 1. Hand saws (crosscut, rip, compass, keyhole, coping, back, hack, dovetail) 2. Hand planes 3. Chisels 4. Rasps, files 5. Spokeshaves Illustrations of hand tools
2. use hand tools for each separation process;	Demonstrate the correct procedures for using hand tools for each of the separation processes. Provide students with opportunities to practice the separation processes on scrap materials. Emphasize safety and care and maintenance of the tools. Discuss and demonstrate safety checks for the various tools. Discuss the advantages and disadvantages of hand tools.	Woodworking Hand Tools (filmstrip), Moreland Latchford Cutting Tools, How To Cut Stock, Wood Planes, Forming and Shaping Tools, Files and Finishing Tools (colour filmstrips, cassettes, study guide), McIntyre Educational Media
3. perform the processes with an increasing degree of accuracy.	Point out the relationship of correct use, care, and maintenancea of tools to the production of top-quality work. Give frequent performance tests covering the tools used for separation processes.	Saws and Sawing, Planes and Their Uses (colour filmstrips, cassettes, program guide), Prentice-Hall Media

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
C. POWER TOOLS The student should be able to:		
1. identify common power tools for shearing, chipping, paring, and shaving;	Show students the power tools commonly used in separation processes (or show illustrations of these tools). Have students identify each tool by name. Give them the names of the separation processes and have them list and/or select power tools used for each process.	COMMON POWER TOOLS FOR SEPARATION PROCESSES 1. Portable saws (circular, sabre, reciprocating) 2. Stationary saws (circular, band) 3. Portable planes (power block, router) 4. Stationary plane (jointer, planer) 5. Portable sanders (belt, disc)
2. use power tools for each separation process;	Demonstrate the correct procedures for using power tools for each of the separation processes. Provide students with opportunities to practice the separation processes on scrap materials. Emphasize safety and care and maintenance of the power tools. Discuss and demonstrate safety checks for the various power tools. Make students aware of the advantages and disadvantages of power tools.	Woodworking Power Tools (filmstrip), Moreland Latchford Operating the Circular Saw, How To Cut Stock, Operating the Band Saw, Operating the Jointer, Operating the Router (colour filmstrips and cassettes), McIntyre Educational Media The Circular Saw, The Sabre Saw, The Router - Parts 1, 2 (colour filmstrips, cassettes, guide, reproducible masters), Prentice-Hall Media
3. perform the processes with an increasing degree of accuracy.	Point out the relationship of correct use, care, and maintenance of tools to the production of top-quality work. Give frequent performance tests covering the tools used for separation processes.	BAND SAW: Installing the Blade, Adjusting the Blade Guides, Curve Cutting, Straight Cutting; CIRCULAR SAW: Sizes and Nomenclature, Controls and Basic

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		Operations, Special Sawing Operations, Sawing and Dadoing with Saw Blade; DISC SANDER: Using the Disc Sander (Parts 1, 2, 3); JOINTER: Sizes and Nomenclature, Controls and Basic Operations, Beveling, Chamfering and Rebetting Operations, Special Operations; PLANER: The 13" x 6" Planer, Various Sizes, How it Works, Precautions, Special Applications (8 mm colour film loops, audio tape cassettes), AIM Educational Aids

X. FASTENING (C.)

Estimated Time: 3 hours

MAJOR OBJECTIVE: To gain knowledge about mechanical and adhesive fastening procedures and to develop skills in the use of tools and materials applicable to these procedures.

TOPICS AND OBJECTIVES	SUGGESTED ACAIVITIES AND NOTES	RESOURCES
	Integrate instruction and practice in the safe use of mechanical and adhesive fasteners and related tools throughout the construction area of study.	
A. METHODS OF FASTENING The student should be able to:		
1. define fastening;	Have students discuss and define fastening.	FASTENING: The process of binding, connecting, securing, holding, attaching, and/or affixing one item to another
2. identify methods of fastening.	Have students list and define the various methods for fastening materials. Emphasize the use of mechanical and adhesive fasteners. Point out the importance of safety precautions and procedures pertinent to each of the fastening processes.	FASTENING METHODS 1. Mechanical 2. Adhesive

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
B. MECHANICAL FASTENING The student should be able to:		
1. explain the concept of mechanical fastening;	Discuss the principles related to the process of mechanical fastening and to the many types of mechanical fasteners.	MECHANICAL FASTENING: The process of using various mechanical fasteners and related tools for the purpose of attaching one item to another
2. identify common mechanical meachanical fasteners;	Show students examples/illustrations of the various types of mechanical fasteners used in construction. Make students aware of the shapes, sizes, and uses of these fasteners. Arrange field trips to hardware stores and/or building supply companies to acquaint students with the many classifications of and storage methods for mechanical fasteners.	MECHANICAL FASTENERS AND RELATED TOOLS 2. Screws - Screw Drivers 3. Bolts and Nuts - Wrenches 4. Rivets - Riveters 5. Staples - Staple Guns
3. select tools to use with common fasteners;	Ask students to choose the proper hand/power tools to use with each type of mechanical fastener. Acquaint students with the principal parts of each of these tools. Have them prepare displays or illustrated reports about mechanical fasteners and related tools.	
4. use mechanical fasteners and related tools;	Demonstrate the correct procedures for using mechanical fasteners and related tools. Emphasize that correct techniques, safety precautions and procedures, and care and maintenance are important in the use of these tools. Provide students with opportunities to practice the various types of mechanical fastening processes and procedures.	Using Nails and Screws, Fastening Wood Parts (colour filmstrips, cassettes, guide), Prentice-Hall Media Hand Tool Safety (colour filmstrip, cassettes, guide, reproducible masters), Prentice-Hall Media

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		Fasteners--Nails and Nailing, Wood Screws, Miscellaneous Fasteners (colour transparencies), Arnold-Nasco
5. perform the mechanical fastening processes with increasing proficiency.	Have students select the best type of mechanical fastener for a given job/project. Point out the relationship among correct use, care, and maintenance of tools, proper procedures, and top-quality work. Give frequent performance tests covering the mechanical fasteners and tools used for the fastening process.	Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 1 Woodworking Technology, 3rd ed., McKnight Publishing, Section 13
C. ADHESTIVE FASTENING The student should be able to:		
1. explain the concept of adhesive fastening;	Discuss the many types of adhesives and the principles related to the process of adhesive fastening.	ADHESIVE FASTENING: The process of using various adhesives and related tools for the purpose of affixing one item to another
2. identify common adhesive fasteners;	Provide information and examples explaining the various adhesive fasteners used in construction. Make students aware of the various sizes of sales units, the properties of the various classifications of adhesives, and the uses of each type of adhesive.	Manufacturers' pamphlets TYPES OF ADHESIVES 1. Liquid glue 2. Casein glue 3. Epoxy resin 4. Vegetable glue 5. Synthetic resin glue 6. Cellulose cement 7. Rubber compounds 8. Contact cement 9. Mastics

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. select tools to use with adhesive fastening;	Acquaint students with the various tools used for applying adhesive and for applying pressure during the adhesive fastening process. Identify and discuss the principal parts of each of these tools.	TOOLS FOR ADHESIVE FASTENING 1. Hand screw 2. Bar clamps 3. C-clamps 4. Band clamps 5. Mitre clamps 6. Spring clamps 7. Hand and air operated guns 8. Notched trowels
4. use adhesive fasteners;	Demonstrate the correct procedures for using adhesive fasteners. Provide students with opportunities to practice using various types of adhesives. Emphasize correct techniques, safety precautions and procedures, and proper storage methods.	Introduction to Woodworking and Construction, McGraw-Hill Ryerson, Chapter 5, pp. 77-83 Adhesives and Gluing--Woodworking Glues, Tips for Gluing (colour transparencies), Arnold-Nasco Adhesion (16 mm sound colour film), Library, Manitoba Department of Education
5. perform the adhesive fastening processes with increasing proficiency.	Have students select the best type of adhesive for a given job/project. Point out the relationship among correct use, care, maintenance and storate of tools, proper procedures, and proficiency of top-quality work. Test frequently on adhesive fastening.	Modern Carpentry, Goodheart-Willcox, pp. 68-69 Woodworking Technology, 3rd ed., McKnight Publishing, Section 13, Topics 122, 123, 124, 125, 126

XI. FOOTINGS AND FOUNDATIONS (C.) Estimated Time: 6 hours

MAJOR OBJECTIVE: To recognize the significance of, to gain knowledge about, and to explore skills pertinent to footings and foundations.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. FOOTING The student should be able to:		
1. define footing;	Have students research, discuss, and define footings. Arrange a visit to a building site to acquaint students with different sizes, shapes, and locations of footings.	FOOTING: A foundation/support for a column; the enlarged base at the bottom of masonry walls and columns
2. explain the purpose of footings;	Emphasize that footings act as a base/support transmitting the load or weight of a structure to the undisturbed soil beneath. Make students aware that footings are the bottommost part of a structure. Point out the importance of constructing footings to lessen any settlement or movement when a structure is completed. Discuss the need to consider site selection, type of soil, and function and design of structure before deciding upon the type of footing.	Footing and Excavation (colour transparency), Building Construction Series, AIM Educational Aids
3. recognize the different types of footings.	Have students sketch and label diagrams that list materials used for the different types of footings. Point out that a footing is part of a foundation.	TYPES OF FOOTINGS 1. Spread 2. Slab or raft

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		3. Pile Building Foundations (filmstrip, cassette for Exploring Construction), McKnight Publishing Building Foundations (filmstrip, cassette for World of Construction), McKnight Publishing The Foundation (16 mm colour film), Circle Oak Productions
B. FOUNDATION The student should be able to:		
1. define foundation;	Have students research, discuss, and define foundations.	FOUNDATION: The lower portion of a building, including the footing, made of either concrete, masonry, or wood Foundation (colour transparency), Building Construction Series, AIM Educational Aids
2. identify the parts of a foundation.	Provide students with information about the parts of a foundation. Have them define, explain the purpose of, diagram and label the three parts of a foundation: bearing surface, footing, and upright supports.	BEARING SURFACE: The ground directly under the footing FOOTING: The first part of the structure that is placed on the bearing surface

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		UPRIGHT SUPPORTS: The wall or column placed on the footing Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 6 Building Construction Materials and Methods, rev. metric ed., Gage Publishing, Chapter 7 Exploring the Construction Industry, Concept 8; and World of Construction, 5th ed., McKnight Publishing, Readings 31, 32
C. FORMS FOR FOOTINGS AND FOUNDATIONS The student should be able to:		
1. define form;	Have students research, discuss, and define forms.	FORM: An enclosure made of boards, plywood, or metal, for holding green concrete to the desired shape until it is set and thoroughly dried
2. describe the different types of foundation forming for a concrete slab, concrete wall, and wooden wall;	Provide students with or ask them to collect information about the different types of foundation forming, the materials required, and the methods of constructing. Demonstrate the construction of foundation forming and discuss the materials and tools used. Review the basic carpentry	Understanding Masonry Work (filmstrip, cassette for Exploring Construction), McKnight Publishing Understanding Masonry (filmstrip, cassette for World of Construction), McKnight Publishing

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	skills related to foundation forming, and provide students with opportunities to practice these. Emphasize safety precautions and procedures. Have students prepare working models of foundation forming.	
3. recognize the basic knowledge and techniques related to the use of concrete.	Discuss and have students collect information about concrete. Demonstrate techniques and equipment for mixing, placing, and finishing concrete. Have students experiment in groups with mixing, placing, and finishing concrete in relation to their models of foundation forming. Emphasize safety and accuracy.	Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 5 Exploring the Construction Industry, Concept 9; and World of Construction, 5th ed., McKnight Publishing, Reading 33 Rough Carpentry and Masonry, 2nd ed., SI metric, McGraw-Hill Ryerson, Chapters 2, 3, 4

XII. FLOORS (C.) Estimated Time: 6 hours

MAJOR OBJECTIVE: To gain knowledge about the importance of sound, rigid floor frames and skill in their construction.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. FLOOR PLAN The student should be able to:		
1. define floor plan;	Show students examples of various floor plans. Have students discuss and define floor plan.	FLOOR PLAN: Architectural drawing showing the length and width of a building and the location of rooms within the building
2. explain the purpose of a floor plan;	Have students study examples of floor plans to become acquainted with their main purpose: to show the location of rooms, doors, windows, storage areas, and hallways. Point out the symbols used in floor plans that show how finished houses will look.	Examples of floor plans Floor Plan (colour transparency), Building Construction Series, AIM Educational Aids
3. draw a simple floor plan.	Review requisite content from Module V, Planning and Design. Discuss and demonstrate the procedures for drawing to scale on graph paper a simple floor plan for a single-story dwelling. Have students complete a scale drawing for a simple floor plan. Emphasize the importance of grouping rooms together by function to organize space efficiently.	Housing Decisions, Goodheart-Willcox, Chapter 6 ROOM GROUPING BY FUNCTION 1. Quiet area - bedrooms, bathrooms 2. Work area - kitchen, laundry area, utility room, garage 3. Social area - dining room, living room, family room, entrances

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
B. FLOOR FRAME The student should be able to:		
1. recognize the relationship of the floor frame to a building;	Discuss the relationship of the floor frame to the whole structure. Point out that a properly constructed floor is necessary for a stable building, providing support for walls and partitions, and acting as an assembly area for walls and partitions.	The Wood Shell (16 mm sound colour film, guide), Circle Oak Productions Wood Frame Construction (16 mm sound colour film, guide), Circle Oak Productions
2. identify the various types of supports for floors;	Review Module XI, Footings and Foundations. Point out that floors are supported by footings, foundations, tele-posts, and beams. Have students examine buildings under construction and/or study plans and specifications of buildings to determine the relationship of floors to the various types of supports.	FLOOR SUPPORTS 1. Footings 2. Foundations 3. Tele-posts 4. Beams Floor Framing Plan and Floor Framing Section (colour transparencies), Building Construction Series, AIM Educational Aids
3. explain the function of the parts of a floor frame;	Discuss diagrams and models of floor frames. Point out beams, columns, joists, bridging, and sub-flooring. Acquaint students with the types of materials used. Have them describe the functions of each of the parts of a floor frame: a) Beams are intermediate supports for floor joists. b) Columns are intermediate supports for beams.	Modern Carpentry, Goodheart-Willcox, Unit 7 Exploring the Construction Industry, McKnight Publishing, Concept 4 World of Construction, McKnight Publishing, Reading 37

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	c) Joists are framing pieces that rest on outer foundation walls, interior beams, or girders, and support floor boards. d) Bridging is an arrangement of small wooden or metal pieces between timbers, such as joists, to stiffen them and hold them in place. e) Sub-flooring is any material, often an inferior grade of lumber or softwood, laid on joists to support the finished floor. Have students refer to the local building code and report requirements that apply directly to floor framing.	Building Construction Materials and Methods, Gage Publishing, Chapters 8, 9, 10, 11, 12 Building Construction Technology, McGraw-Hill Ryerson, Chapter 7
4. construct a floor frame.	Demonstrate the construction of a floor frame and have students prepare a working model. Have them integrate the floor frame model with the model for footings and foundations. Have them list and estimate the costs of the materials required to frame a floor. Emphasize accuracy, conservation, and safety precautions and procedures.	Introduction to Woodworking and Construction, McGraw-Hill Ryerson, Part Two, Chapter IV

XIII. WALLS AND PARTITIONS (C.)

Estimated Time: 6 hours

MAJOR OBJECTIVE: To obtain information and to develop skills related to the construction of wall and partition framing.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. WALLS		
The student should be able to:		
1. define wall;	Have students discuss and define walls.	WALL: An upright structure of definite dimensions for enclosing space as a building or a room
2. recognize the relationship of wall framing to a building.	Point out the relationship of wall framing to the whole structure. Emphasize that wall framing includes the assembling of vertical and horizontal members that make up the exterior and interior walls of the structure. Make students aware that the wall framework supports the upper floors, ceilings, and roofs and provides a nailing base for inside and outside wall covering materials. Provide students with a model and/or arrange a field trip to a construction site to study wall framework.	The Wood Shell (16 mm sound colour film, guide), Circle Oak Productions Wood Frame Construction (16 mm sound colour film, guide), Circle Oak Productions Wall Assembly (colour transparency), Building Construction Series, AIM Educational Aids

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
B. PARTITIONS The student should be able to:		
1. define partition;	Have students discuss and define partitions. Demphasize that partitions are used to divide the area enclosed by exterior walls into rooms.	PARTITION: An interior wall separating one portion of a house or building from another; usually a permanent inside wall which divides a house into various rooms
2. identify the main types of partitions.	Point out that there are two main types of partitions. Have students locate these in a drawing, a model, and/or a house at a construction site. Make students aware of the functions of partitions: a) Bearing partitions serve as room dividers and support floor, ceiling, and roof loads. b) Non-bearing partitions serve as room dividers and provide support for wall finishes, doors, and other structures attached to them. Have students study drawings, models, and/or a house at a construction site to determine the differences between materials and methods for constructing bearing and non-bearing partitions.	TYPES OF PARTITIONS 1. Bearing 2. Non-bearing

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
C. WALLS AND PARTITIONS The student should be able to:		
1. define platform construction;	Discuss and show students illustrations of platform construction. Have them prepare a definition.	PLATFORM CONSTRUCTION: A type of construction in which the floor platform is framed independently of the wall sections.
2. describe the function of platform construction;	Emphasize that the floor provides a base/platform upon which to construct and assemble walls and partitions safely and accurately and raise them into place.	
3. explain the functions of the essential parts of walls and partitions;	Have students study and discuss drawings and models of walls and partitions. Point out plates, studs, headers, cripples, sills, and sheathing and have students identify the functions of each of these essential parts.	PLATE: Horizontal member at the top and bottom of a wall frame used to support and align wall studs STUD: One of a series of vertical members used in constructing wall and partition framework HEADER: Horizontal member that supports the load over door and window openings CRIPPLE: Studding less than full length and cut short for use under door and window openings SILL: Bottom member of a window or exterior door frame

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		SHEATHING: Material used to cover the framework of buildings on the exterior
4. prepare a scale drawing for framing walls and partitions;	Have students examine buildings under construction and study a set of architectural plans for a single-story house, noting the construction details related to wall sections and partitions. Discuss and demonstrate the procedures for preparing a scale drawing on graph paper of framing required for one of the walls, such as the front wall. Emphasize the importance of being accurate in assessing size and location of rough openings. Have students complete a scale drawing for wall framework. Have them prepare a list of materials and cost estimates for specific wall and partition frames.	Building Construction Materials and Methods, Gage Publishing, Chapters 12, 13, 14 Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 8 Modern Carpentry, Goodheart-Willcox, Unit 8 World of Construction, McKnight Publishing, Reading 37
5. construct wall and partition framework.	Have students research the local building code to determine if there are requirements that directly apply to wall and partition framework. Demonstrate the construction of exterior walls and interior partitions and have students prepare working models of these, showing plates, studs, headers, cripples, sills, sheathing, and window and door frames. Emphasize the importance of accuracy, of conservation of materials and energy, and of following safety precautions and procedures in handling materials and using hand and power tools.	Exploring the Construction Industry, McKnight Publishing, Concept 15 Introduction to Woodworking and Construction, McGraw-Hill Ryerson, Part Two, Chapter V

XIV. ROOFS (C.)

Estimated Time: 6 hours

MAJOR OBJECTIVE: To collect information about roof styles and to gain skills pertinent to roof framing and construction.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. ROOF STYLES The student should be able to:		
1. describe the functions of roofs;	Make students aware of the various functions of roofs.	FUNCTIONS OF ROOFS 1. To cover tops of buildings 2. To protect structures from weather 3. To add beauty to structural designs
2. identify roof styles.	Show students diagrams of various types of roof styles. Have them identify roof styles in their communities. Make them aware that the style of roof chosen for a structure depends upon the following factors: size and design of structure, climate, appearance, and cost. Have students collect information and prepare illustrated reports about the relationship between roof styles and climates.	ROOF STYLES 1. Hip 2. Gable 3. Flat 4. Shed 5. Butterfly 6. Gambrel 7. Mansard 8. Monitor Roof Types and Roof Nomenclature (colour transparencies), Building Construction Series, AIM Educational Aids

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
B. ROOF FRAMING The student should be able to:		
1. define roof framing;	Have students discuss and define roof framing.	ROOF FRAMING: The process or method of putting the parts of a roof, such as rafters, ridge, and plates, in position The Wood Shell (16 mm sound colour film, guide), Circle Oak Publications
2. explain how roofs are sized;	Emphasize that roofs are sized by their span, rise, and slope. Show students a diagram of a conventional wood roof frame, with labelled span, rise, and slope. Have students define these terms. Make them aware that the slope influences the strength of a roof.	SPAN: The width of a roof RISE: The height of a roof SLOPE: The angle between the span and the rise of a roof
3. identify the parts of a conventional wood roof frame;	Give students a copy of a simple drawing of a conventional wood roof frame. Have them locate and label the following parts on the drawing: top plate, collar tie, rafter, ridge board, gable end studs, fascia, and soffit. Make students aware of the possible uses of truss rafters. Have them explain the purpose of each part of a conventional wood roof frame.	Building Construction Materials and Methods, Gage Publishing, Chapters 15-23 Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapters 9-11
4. prepare a scale drawing for a conventional wood roof frame;	Have students examine a conventional wood frame structure under construction, study a set of architectural plans for the same type of structure, and note the construc-	Modern Carpentry, Goodheart-Willcox, Units 9-10

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	tion details related to roof framing. Discuss and demonstrate the procedures for preparing a scale drawing on graph paper of roof framing. Emphasize the relationship of the roof framing plan to the floor and wall framing plans. Have students prepare a list of materials and cost estimates for a roof framing plan.	*The World of Construction*, McKnight Publishing, Concept 37 *Exploring the Construction Industry*, McKnight Publishing, Concept 16
5. construct and shingle a conventional wood roof.	Have students research the local building code to determine if there are requirements that directly apply to roof framing and construction. Demonstrate the construction of roof framing and have students prepare working models showing top plates, collar ties, ridge boards, gable end studs, rafters, fascia, soffits, and the use of sheathing, protective cover and shingles. Emphasize the importance of accuracy, of conservation of materials and energy, and of following safety precautions and procedures in handling materials and using hand and power tools.	Local building code Illustrations of top plates, collar ties, ridge boards, gable end studs, rafters, fascia, and soffits
	Enrichment projects: Have students prepare working models of roof framing for other types of roofs. Encourage students to collect information about various types of roof sheathing and protective covering materials and shingles. Make them aware that different styles of roofs require different types of enclosing methods and materials.	Catalogues and advertising literature from building supply offices

XV. ENCLOSING (C.)

Estimated Time: 4 hours

MAJOR OBJECTIVE: To explore the construction technology, skills, and materials used to enclose the exterior of a structure.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. FUNCTION OF ENCLOSING The student should be able to:		
1. describe roof enclosing;	Review the concepts and skills covered in Module XIV, Roofs.	The Wood Shell (16 mm sound colour film, guide), Circle Oak Productions
2. explain the function of enclosing.	Discuss and emphasize the following purposes of enclosing: - to cover the outside framed structure in order to protect the interior from weather; - to add rigidity and strength to the framework; - to provide some insulation for the conservation of energy; - to provide a base for final exterior finishes.	Enclosing and Finishing the Exterior and Framing and Enclosing Residential Exteriors (filmstrips and cassettes), McKnight Publishing

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
B. ENCLOSING WALLS The student should be able to:		
1. recognize the relationship between wall framework and enclosing;	Review the function of enclosing and the wall framing concepts and skills covered in Module XIII, Walls and Partitions. Point out that wall sheathing is the base material attached directly to the studding and that installation of doors and windows is part of the enclosing process. Make students aware that the sheathing provides the base to which final exterior finishes such as siding are nailed and brick or other masonry materials are applied.	
2. identify the materials used for enclosing walls, doors, and windows;	Discuss and have students collect information for reports or displays about the properties of the various materials used for wall enclosing, such as plywood, fibreboard, particleboard, gypsum board, solid wood, and foamed plastic panels. Emphasize that the type of material used is dependent on the function for which the structure is intended and on climatic conditions.	Building Construction Materials and Methods, rev. metric ed., Gage Publishing, Chapter 14 Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapters 8, 12 Modern Carpentry, Goodheart-Willcox, Units 8, 11 Exploring the Construction Industry, McKnight Publishing, Concept 20 World of Construction, McKnight Publishing, Reading 43

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. enclose walls, doors, windows.	Identify and describe the various types of doors and windows and the methods of framing used for each. Have students research the local building code to determine if there are requirements that directly apply to enclosing walls, doors, and windows. Demonstrate the procedures for applying some of the enclosing materials. Integrate the working models prepared in previous modules into the activities and procedures related to enclosing. Emphasize measurement procedures, accuracy, conservation of materials and energy, and the importance of safety precautions and procedures in handling materials and using hand and power tools.	Illustrations of various types of doors and windows Local building code Door Framing, Window Framing, Double Hung Windows, Window Types and Doors (colour transparencies), Building Construction Series, AIM Education Aids

XVI. ENERGY AND INSULATION (C.)

Estimated Time: 6 hours

MAJOR OBJECTIVE: To explore the construction technology, knowledge, skills, methods, and materials related to energy and insulation.

TOPICS AND OBJECTIVES	NOTES AND SUGGESTED ACTIVITIES	RESOURCES
A. ENERGY The student should be able to:		
1. describe the relationship of energy sources to building structures;	Point out in that people need heat inside their bodies, in their homes, and in their total environment in order to live.	Newspapers and periodicals
2. identify categories of energy sources.	Explain that like all forms of energy, fuel, used for home heating, begins as solar energy. Indicate that by means of a lengthy process, nature converts solar energy to raw materials such as oil and coal. Make students aware that some of the common sources of energy are reaching depletion. Introduce them to these categories of energy sources: non-renewable and renewable sources. Have students report about non-renewable and renewable sources of energy. Emphasize that renewable energy sources are the sun, winds, water, plants, or the earth's internal heat which can be converted into these renewable energy resources: solar	CATEGORIES OF ENERGY SOURCES 1. Non-renewable sources 2. Renewable sources The Energy Carol (16 mm sound colour film), Canada Department of Energy, Mines and Resources Energy For the Future (16 mm sound colour film), Encyclopedia Britannica Educational Corporation Energy--The Fuels and Man (16 mm sound colour film), National Geographic Society

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	energy, wind energy, tidal power, biomass energy, geothermal energy.	Housing Decisions, Goodheart-Willcox Company, pp. 288-292
	Have students research the possibility of garbage as a source of energy.	BIOMASS ENERGY: The energy of plant and animal matter
	Discuss energy conservation.	GEOTHERMAL ENERGY: The energy stored beneath the surface of the earth
B. INSULATION The student should be able to:		
1. define insulation;	Have students discuss and define insulation. Explain the relationship between the enclosing process, insulation, and conservation of energy.	INSULATION: Materials used to block the transfer of heat or sound between the inside and outside of a structure or between parts of a structure.
2. explain the purposes of insulation;	Make students aware of the following uses of insulation: - to conserve energy; - to reduce transfer of heat; - to retard the spread of fire; - to deaden sound; - to provide a vapour barrier; - to lower heating and cooling costs.	World of Construction, McKnight Publishing, Readings 45, 46
3. identify types of insulating materials;	Point out that some insulating materials, classified as mineral, are made from earth materials such as sand, glass, mica, and certain plastics. Indicate that some	Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 14

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	insulation, classified as vegetable, is made from vegetable products such as cork, wood, and plant stalks. Have students collect information about the forms of insulation. Show examples of various kinds of batt/rolled, loose fill, and rigid board insulation. Have students prepare displays of insulating materials.	FORMS OF INSULATION 1. Batt or rolled 2. Loose fill 3. Rigid board Samples of insulating materials
4. compare the properties of insulating materials;	Explain that R value, thermal resistance value, is a measure of a material's resistance to heat transfer and that the higher the R value the greater the insulation value. Have students collect information about other properties and their relationship to humidity, vapour barriers, humidifiers, air conditioners, and insulation. Discuss the relationship between heating, ventilation, and humidity. Make students aware of the following concerns: combustibility, toxic fumes, and vermin.	Building Construction Materials and Methods, rev. metric ed., Gage Publishing, pp. 161-162 Advertisements and brochures
5. describe methods of installing insulation.	Point out that heat loss from a house occurs in these areas: basement, floor, walls, windows, ceiling, and roof. Have students research the building code and report the requirements that directly apply to insulation. Discuss and demonstrate methods of installing insulation. Ask students to make cutaway models of different types of insulation. Have them install vapour barriers and insulation in some of their working models. Emphasize the importance of safety precautions and procedures in handling and installing insulation.	Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 14 Exploring the Construction Industry, McKnight Publishing, pp. 366-367 Building code

XVII. EXTERIOR FINISH (O.)

Estimated Time: 4 hours

MAJOR OBJECTIVE: To explore the construction technology, skills, methods, and materials used to finish the exterior of a structure.

TOICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. FUNCTION OF EXTERIOR FINISH The student should be able to:		
1. describe the function of exterior finish;	Discuss and emphasize the following purposes of exterior finishing: - to protect the structure against climate; - to improve the appearance of the structure; - to aid in the care and maintenance of the structure. Make students aware of the relationship between enclosing and finishing the exterior of a structure.	Enclosing and Finishing the Exterior and Framing and Enclosing Residential Exteriors (filmstrips and cassettes), McKnight Publishing
2. identify the main categories of exterior finishes.	Point out that there are two main categories of exterior finishes: structural and applied.	

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
C. APPLIED FINISHES The student should be able to:		
1. recognize common applied exterior finishes;	Have students identify various applied exterior finishes used in their communities. Arrange field trips to construction sites and building/paint supply businesses to acquaint students with the varieties of common applied exterior finishes. Emphasize the importance of considering the following when selecting applied exterior wall finishes: climate, initial cost, durability, maintenance, ease of application, and appearance.	COMMON APPLIED-EXTERIOR FINISHES 1. Alkyd and latex paints 2. Varnish and urethane 3. Stain
2. explain the properties of common applied exterior finishes;	Have students collect information from container labels and from employees in building and paint supply businesses. Ask students to prepare illustrated reports and/or charts on the properties of various applied exterior finishes.	Catalogues, advertising literature, and labels Exploring the Construction Industry, McKnight Publishing, Concept 22
3. use applied exterior finishes.	Discuss and demonstrate the application of common applied exterior finishes and have students apply these to various sample pieces or to their working models. Emphasize safety and methods of handling tools and materials to ensure their care and maintenance.	Painting and decorating tools and equipment

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
B. STRUCTURAL FINISHES The student should be able to:		
1. recognize the common structural exterior finishes;	Have students identify various structural exterior finishes used in their communities. Arrange field trips to sites and building supply businesses to acquaint students with the many different varieties and styles of common exterior finishes. Emphasize the importance of considering the following when selecting structural exterior wall finishes: climate, initial cost, durability, maintenance, appearance.	COMMON STRUCTURAL EXTERIOR FINISHES 1. Wood 2. Metal 3. Stone 4. Brick 5. Stucco 6. Plastics 7. Masonry veneer The World of Construction, McKnight Publishing, Reading 43
2. explain the properties of the common structural exterior finishes;	Discuss the properties of various structural exterior finishes. Have students collect information about these properties to use in illustrated reports and/or charts.	Catalogues and advertising literature Building Construction Materials and Methods, rev. metric ed., Gage Publishing, Chapter 24
3. apply structural exterior finishes.	Demonstrate the application of some of the common structural exterior finishes and have students apply these to sample pieces or to their working models. Emphasize accuracy, safety, and proper methods of handling tools and materials.	Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapter 24 Exploring the Construction Industry, McKnight Publishing, Concept 20 Modern Carpentry, Goodheart-Willcox, Unit 12

XVIII. INTERIOR FINISH AND TRIM (O.)

Estimated Time: 4 hours

MAJOR OBJECTIVE: To explore the construction technology, skills, methods, and materials used to finish and trim the interior of a structure.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. FUNCTION OF INTERIOR FINISH The student should be able to:		
1. describe the function of interior finish;	Discuss and identify the following purposes of interior finishing: - to cover framed areas inside the structure; - to cover and seal all joints inside the structure; - to improve the inside appearance of the structure; - to hide structural members and utilities; - to aid in controlling sound; - to provide fire protection; - to aid in the care and maintenance of the structure. Make students aware of the relationship between exterior finishing, framework, insulation, and interior finishing of the structure.	Finishing the Interior and Completing the Site (filmstrip and cassette), McKnight Publishing

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
2. identify the main categories of interior finishes.	Explain the two main categories of interior finishes: structural and applied.	
B. STRUCTURAL FINISHES The student should be able to:		
1. recognize the common structural interior finishes;	Discuss some of the common methods of completing the interior of a structure, such as putting up dry wall, panelling, masonry veneer, suspended ceilings, interior doors, and various trim materials. Arrange field trips to construction sites and building supply houses and refer to building plans and specifications to acquaint students with the many different methods and materials used for structural interior finishing. Emphasize the importance of considering the following when selecting structural interior finishes: climate, initial cost, strength, durability, care and maintenance, and appearance.	The World of Construction, McKnight Publishing, Readings 47, 48
2. explain the properties of the common structural interior finishes;	Discuss the properties of various interior finishes and have students collect information about these properties to be used in illustrated reports and/or charts, posters, and bulletin board displays. Make students aware of insulating, fire resistance, and sound control qualities.	Building Construction Technology, SI metric, McGraw-Hill Ryerson, Chapters 15, 16 Modern Carpentry, Goodheart-Willcox, Units 14, 15

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. apply structural interior finishes.	Demonstrate the application of some of the common structural interior finishes and have students apply these to sample pieces or to their working models. Emphasize accuracy, safety, and energy conservation when introducing methods of handling tools and materials.	Exploring the Construction Industry, McKnight Publishing, Concept 23
C. APPLIED FINISHES The student should be able to:		
1. recognize the common applied interior finishes;	Have students identify the various types of applied interior finishes as they pertain to walls, ceilings, and floors. Arrange field trips to construction sites and to building, paint and floor covering supply businesses to acquaint students with the varieties of common applied interior finishes. Emphasize the importance of considering the following when selecting applied interior finishes: initial cost, durability, care and maintenance, sound control, light reflection, fire resistance, ease of application, and appearance.	COMMON APPLIED INTERIOR FINISHES 1. WALLS: Paint, varnish, plaster, wallpaper, wood, ceramic 2. CEILINGS: Tile, plaster 3. FLOORS: Wood, vinyl, linoleum, ceramic, rubber, carpet World of Construction, McKnight Publishing, Reading 49
2. explain the properties of the common applied interior finishes;	Discuss and have students research the properties, advantages, and disadvantages of applied interior finishes.	Exploring the Construction Industry, McKnight Publishing, Concept 23

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. use applied interior finishes.	Discuss and demonstrate the application of some applied interior finishes/materials and have students use these on sample pieces and on their working models. Point out that trimming, painting, decorating, and installing accessories are types of finishing work. Emphasize safe and accurate techniques and methods of handling tools and materials to ensure their care and maintenance. Make students aware that finishing work requires care and skill, and that a sloppy job can reflect and affect a worker's self-image.	TOOLS FOR INTERIOR FINISHES 1. Basic hand tools 2. Basic power tools 3. Masonry tools 4. Painting tools

XIX. PLUMBING SYSTEM (O.)

Estimated Time: 3 hours

MAJOR OBJECTIVE: To gain knowledge about plumbing systems and to use skills to complete simple activities related to plumbing.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. PLUMBING AND PLUMBING SYSTEM The student should be able to:		
1. define plumbing;	Have students discuss and define plumbing.	PLUMBING: Piping systems
2. identify purposes of a plumbing system.	Take students on a tour of the school to survey the plumbing system. Have them look for source, transmission, control, and use of plumbing. Identify the parts of a plumbing system that moves fresh water, hot water, and water for fire protection, sewage, and drainage. Make students aware of these components: many kinds of piping, tubing, valves, and fittings.	Introduction to Installing Utilities and Utility Systems (filmstrips, cassettes), McKnight Publishing
B. SUPPLY SYSTEMS		
	Emphasize the relationship of building codes and approval by government agencies to supply systems for plumbing.	Building codes Department of Health regulations

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
The student should be able to:		
1. identify the common sources of water supply;	Discuss the common sources of water supply for plumbing systems.	SOURCES OF WATER SUPPLY 1. Lakes 2. Rivers 3. Wells
2. recognize common methods of distribution;	Show students methods of distribution, including pipes, valves, meters, and fixtures. Emphasize conservation practices.	The Home Pro Plumbing Guide, Minnesota Mining and Manufacturing Company
3. use some basic plumbing skills.	Demonstrate and have students perform simple plumbing activities, such as changing washers in a tap, cementing polyethlene and ABS piping, and soldering sections of copper pipe. Emphasize the use of safety precautions and procedures in handling materials, tools, and equipment.	World of Construction, McKnight Publishing, Reading 41 Exploring the Construction Industry, McKnight Publishing, Concept 18
C. DISPOSAL SYSTEMS		
	Emphasize the relationship of building codes and approval by government agencies to waste disposal in plumbing systems.	Building codes Department of Health regulations
The student should be able to:		
1. recognize the need for different methods of waste disposal;	Take students on tours of water treatment and waste disposal systems.	

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
2. identify the common methods of waste disposal.	Discuss the common methods of waste disposal for plumbing systems.	METHODS OF WASTE DISPOSAL 1. Sewers 2. Septic tanks 3. Fields

XX. ELECTRICITY (O.)

Estimated Time: 8 hours

MAJOR OBJECTIVE: To gain knowledge about electricity and inside electrical systems and to use skills to connect a basic circuit.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. GENERATION AND DISTRIBUTION		
	Emphasize that electricity is an important utility and that it takes many different types of workers to produce, install, and service the electric power used in various types of buildings and structures.	
The student should be able to:		
1. identify sources of electric power;	Make students aware that electric power is generated at coal burning, steam, hydro-electric, or nuclear power plants. (Use visual aids.) Point out the use of portable electric systems to generate power. Arrange field trips to a generation station.	At Your Fingertips, Challenge of the Nelson, Meeting the Challenge, Power-line, A Way of Life (16 mm sound colour films), Film Library, Manitoba Hydro Electricity/Energy (sound colour video-recording), Ontario Educational Communications Authority Energy (16 mm sound colour film), Manitoba Department of Education, Production and School Broadcasts

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
		Energy: A Matter of Choices (16 mm sound colour film), Encyclopedia Britannica Educational Corporation
2. recognize the methods of distributing electricity.	Discuss and trace the path of transmitted electric power. Have students prepare posters and bulletin board displays to show the path of power transmission. Emphasize the sequence and function of each of the following in electric power transmission: generating plant, powerlines, substation, distribution station, and transformer near structure/building.	Exploring the Construction Industry, McKnight Publishing, pp. 302-303
B. INSIDE ELECTRICAL CONSTRUCTION The student should be able to:		
1. describe the purpose of an inside electrical system;	Point out that the inside system distributes power inside a building. Have students prepare a list of the various ways in which electric power is used in each room in a home.	Introduction to Installing Utilities and Utility Systems (filmstrips, cassettes), McKnight Publishing
2. recognize the methods of distributing power inside a building;	Take students on a tour of the school to study its inside electrical system. Have them trace the path of electric power through the following components: service drop, meter, service panel, and branch circuits. Have students prepare a list of the ways in which the school uses electric-	Exploring the Construction Industry, McKnight Publishing, Concept 19 World of Construction, McKnight Publishing, Readings 38, 42

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	ity. Show them copies of the electrical section of architectural drawings. Acquaint them with the electric symbols used and have them trace the inside electrical system in architectural drawings. Have them research the local building code to determine if there are requirements that apply directly to inside electrical systems.	Architectural drawings of inside electric systems Building codes
3. develop an understanding of electrical terminology;	Make students aware of the importance of using and understanding terminology related to electricity in order to communicate with electricians and other construction workers. Discuss the electrical theory and practices related to the terminology. Have students prepare an illustrated report on the purposes, advantages, and disadvantages of fuses and circuit-breakers.	VOCABULARY FOR ELECTRICIANS 1. Volt 2. Ampere 3. Watt 4. Circuit 5. Switch 6. Outlet 7. Receptacle 8. Fuse 9. Circuit-breaker 10. Electric service panel 11. Conductors 12. Grounders 13. "Hot" wires 14. Insulation 15. "Colour-coding" or polarizing 16. Short circuit
4. identify basic tools and fittings used by electricians;	Acquaint students with the basic tools and their functions. Have them prepare a set of posters showing diagrams/illustrations and listing functions of basic tools. Have students build a display board of common electrical fittings.	BASIC TOOLS 1. Hammer 2. Keyhole saw 3. Screwdrivers 4. Folding rule 5. Brace and bit 6. Hacksaw 7. Pliers 8. Cutters 9. Fish tape 10. Circuit tester 11. Conduit bender 12. Chisel COMMON FITTINGS 1. Boxes 2. Conduits 3. Cables 4. Wires 5. Switches 6. Plates 7. Receptacles 8. Connectors

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
5. connect a basic unit.	Demonstrate and have students participate in the steps of wiring basic circuits on bread boards and on models of wall frames. Emphasize the use of safety precautions and procedures in handling materials and tools.	Electric Circuits (16 mm black and white film), McGraw-Hill Book Company

XXI. LANDSCAPING (O.) Estimated Time: 3 hours

MAJOR OBJECTIVE: To explore the construction technology pertinent to landscaping and to design a landscape for completing the construction site.

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
A. LANDSCAPING OVERVIEW The student should be able to:		
1. define landscaping;	Have students discuss and define landscaping. Explain why landscaping is done after the completion of a structure.	LANDSCAPING: The process of changing scenery to beautify a construction site
2. identify the purposes of landscaping;	Have students prepare a report emphasizing these purposes of landscaping: protection, privacy, access, work and play areas, harmonizing structures with surroundings.	
3. describe the principles of landscaping.	Point out the principles of landscaping. Make students aware of the relation of landscape planning to surface water control, storm sewers, buried utilities, visible utilities, size and shape of the property, and the type of structure. Emphasize the components related to these principles of landscaping: a) Building accesses are driveways, walks, and parking areas.	PRINCIPLES OF LANDSCAPING 1. Landscape planning 2. Building accesses and features 3. Shaping earth 4. Planting 5. Cleaning

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
	b) Building features are patios, fences, pools, lights, and plant boxes. c) Shaping earth includes rough grading, finish grading, cultivating, and raking. d) Planting includes trees, shrubs, lawns, flowers, etc. e) Cleaning includes removing temporary facilities, removing equipment, and hauling debris.	Landscaping and Finishing the Inteior and Completing the Site (filmstrips and cassettes), McKnight Publishing
	Emphasize the relationship among all the principles of landscaping.	
B. VALUE AND DESIGN The student should be able to:		
1. recognize the need for pleasant surroundings;	Discuss the need for pleasant surroundings. (Refer to Maslow's pyramid of human needs in Module VI, Consumerism.) Show students examples of sites that are well landscaped, poorly landscaped, and not landscaped.	Exploring the Construction Industry, McKnight Publishing, Concept 24
2. explain how aesthetic value influences property value;	Arrange tours of various locations in the community. Have students assess and compare the various landscape styles. Take them on a visit to a local landscape business and/or a nursery to obtain information to be used in illustrated reports on the importance of and techniques and materials for landscaping.	World of Construction, McKnight Publishing, Reading 51

TOPICS AND OBJECTIVES	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
3. design landscapes.	Discuss designing landscape. Have students, in groups or individually, use sand boxes and/or site boards to plan and develop landscapes for various styles of buildings. Have them layout drainage systems, walks driveways, patios, retaining walls, steps, and ramps.	Site boards Sand boxes Scale models of trees, shrubs, cars, people

bibliography

BIBLIOGAPHY

TEXTBOOKS

Betts, Roger et al. Exploring the Construction Industry. Bloomington, IL: McKnight Publishing Company, 1976. (Distributed by Nelson Canada.)

Cannon, Kenneth et al. Building Construction Technology, SI Metric. Scarborough, ON: McGraw-Hill Ryerson, 1982.

Lux, Donald G. et al. World of Construction. Bloomington, IL: McKnight Publishing Company, 1982. (Distributed by Nelson Canada.)

REFERENCE BOOKS

Atkinson, Henry F. Rough Carpentry and Masonry, 2nd ed., SI Metric. Scarborough, ON: McGraw-Hill Ryerson, 1981.

Betts, Roger et al. Activity Booklets Exploring the Construction Industry. Bloomington, IL: McKnight Publishing Company, 1976. (Distributed by Nelson Canada.)

----------. Construction Module Demonstration Charts Exploring the Construction Industry. Bloomington, IL: McKnight Publishing Company, 1976. (Distributed by Nelson Canada.)

----------. Survey and Community Development Package Exploring the Construction Industry. Bloomington, IL: McKnight Publishing Company, 1976. (Distributed by Nelson Canada.)

----------. Teacher's Guide for Exploring the Construction Industry. Bloomington, IL: McKnight Publishing Company, 1976. (Distributed by Nelson Canada.)

Campbell, S. R. The Confident Consumer. South Holland, IL: The Goodheart-Willcox Company, 1982. (Distributed by General Publishing Company.)

Canada Department of Manpower and Immigration. The Canadian Classification and Dictionary of Occupations. Ottawa, ON: The Department, 1971-1973.

----------. CAREERS Manitoba 1981, Volumes 1, 2, 3, 4. Ottawa, ON: The Department, 1981.

----------. Training Manual for Canadian Classification and Dictionary of Occupations, Vol. I. Ottawa, ON: The Department, 1972.

----------. Creating a Career, Instructor's Manual. Ottawa, ON: The Department, 1977.

----------. Creating a Career, Student's Book. Ottawa, ON: The Department, 1977.

Canada Handbook. Ottawa, ON: Information Division, Statistics Canada, current year.

Canada Year Book. Ottawa, ON: Information Division, Statistics Canada, current year.

Feirer, John L. Industrial Arts Woodworking, 2nd ed. (rev.). Peoria, IL: Chas. A. Bennett, 1982. (Distributed by

Copp Clark Pitman.)

Groneman, Chris H. et al. *Technical Woodworking*, 2nd ed. New York, NY: McGraw-Hill Book Company, 1975.

Hammond, James J. et al. *Woodworking Technology*, 4th ed. Bloomington, IL: McKnight Publishing Company, 1980. (Distributed by Nelson Canada.)

Harris, Edward. *Introduction to Woodworking and Construction*, rev. ed. Scarborough, ON: McGraw-Hill Ryerson, 1976.

Horning, W. *Construction: Systems and Materials*. Englewood Cliffs, NJ: Prentice-Hall, 1976.

Landers, Jack. *Construction Materials, Methods, Careers*. South Holland, IL: The Goodheart-Willcox Company, 1982. (Distributed by General Publishing Company.)

Lewis, Evelyn L. *Housing Decisions*. South Holland, IL: The Goodheart-Willcox Company 1978. (Distributed by General Publishng Company.)

Lux, Donald G. et al. *Achievement Tests: World of Construction*. Bloomington, IL: McKnight Publishing Company, 1982. (Distributed by Nelson Canada.)

----------. *Laboratory Manual I: World of Construction*. Bloomington, IL: McKnight Publishing Company, 1982. (Distributed by Nelson Canada.)

----------. *Laboratory Manual II: World of Construction*. Bloomington, IL: McKnight Publishing Company, 1982. (Distributed by Nelson Canada.

----------. *Teacher's Guide: World of Construction*. Bloomington, IL: McKnight Publishing Company, 1982. (Distributed by Nelson Canada.)

Manitoba Department of Education. *Safety/Health Guide for Industrial Arts, Vocational, Home Economics, and Business Education*. Curriculum Support Series. Winnipeg, MB: The Department, 1981.

----------. *The Manitoba Career Guide*. Winnipeg, MB: The Department, n.d.

Manitoba Trade Directory. Winnipeg, MB: Sanford Evans Publishing, 1982.

Miller, H. G. *Building Construction Materials and Methods*, rev. metric ed. Agincourt, ON: Gage Publishing, 1980.

Ontario Federation of Labour. *Occupational Health and Safety: A Training Manual*. Toronto, ON: Copp Clark Pitman, 1982.

Spence, W. *Construction: Industry and Careers*. Englewood Cliffs, NJ: Prentice-Hall, 1976.

Wagner, Willis H. *Modern Carpentry*. South Holland, IL: The Goodheart-Willcox Company, 1979. (Distributed by General Publishing Comapny.)

Zook, Wayne. *Constructing and Manufacturing Wood Products*. Bloomington, IL: McKnight Publishing Company, 1973. (Distributed by Nelson Canada.)

MANITOBA LAW STATUTES

The Workers' Compensation Act. Manitoba Law Statutes, 1976-1979.

The Workplace Safety and Health Act. Manitoba Law Statutes, 1977-1978.

AUDIO-VISUAL MATERIALS

The following audio-visual materials, published by DCA Educational Products, Warrington, PA 18976, are available from Administration Information Media (AIM) Educational Aids, P. O. Box 86704, North Vancouver, BC V7L 4L2:

1. Colour Transparencies, Overlays, Guide

   - Building Site (BC-1)
   - Labor and Materials (BC-2)
   - Legal Restrictions (BC-3)
   - Building Layout (BC-4)
   - Footing and Excavation (BC-5)
   - Foundation (BC-6)
   - Wall Section (BC-7)
   - Floor Plan (BC-8)
   - Foundation Plan (BC-9)
   - Sill Anchoring (BC-10)
   - Setting Joists (BC-11)
   - Floor Framing Plan (BC-12)
   - Floor Framing Section (BC-13)
   - Corners (BC-14)
   - Wall Assembly (BC-15)
   - Door Framing (BC-16)
   - Window Framing (BC-17)
   - Roof Types (BC-18)
   - Roof Nomenclature (BC-19)
   - Front Elevation (BC-20)
   - Right Elevation (BC-21)
   - Double Hung Windows (BC-22)
   - Window Types (BC-23)
   - Doors (BC-24)

2. Colour, 8 mm Film Loops and Cassettes

   a) Band Saw
      - Installing the Blade (ZAB011)
      - Adjusting the Blade Guides (ZAB021)
      - Curve Cutting (ZAB031)
      - Straight Cutting (ZAB041)
      - Metal Cutting on the Band Saw (ZAB051)

   b) Circular Saw
      - Sizes and Nomenclature (ZAC011)
      - Controls and Basic Operations (ZAC021)
      - Special Sawing Operations (ZAC031)
      - Sawing and Dadoing with Saw Blade (ZAC041)
      - Using the Dado Set (ZAC051)
      - Using the Molding Cutterhead (ZAC061)

   c) Disc Sander
      - Using the Disc Sander - Part 1 (ZAY011)
      - Using the Disc Sander - Part 2 (ZAY021)
      - Using the Disc Sander - Part 3 (ZAY031)

   d) Jointer
      - Sizes and Nomenclature (ZAJ011)
      - Controls and Basic Operations (ZAJ021)
      - Bereling, Chamfering, and Robetting Operations (ZAJ031)
      - Special Operations (ZAJ041)

   e) Planer
      - The 13" x 6" Planer (ZAP011)
      - Various Sizes (ZAP021)
      - How It Works (ZAP031)
      - Precautions (ZAP041)
      - Special Applications (ZAP051)

The following audio-visual materials are available from Arnold-Nasco, Ltd., 58 Dawson Road, Guelph, ON N1H 1A8:

1. Colour Transparencies, Overlays, Guide

   a) Fasteners
      - Nails and Nailing
      - Wood Screws
      - Miscellaneous Fasteners

   b) Adhesives and Gluing
      - Woodworking Glues
      - Tips for Gluing

The following audio-visual materials are available from Copp Clark Pitman, 517 Wellington Street, W., Toronto, ON M5V 1G1:

1. Slides 35 mm, Cassettes, and Student Manual

   - Foundations I - Slab-on-Grade
   - Foundations II - Crawl Space, Basement, and Piles
   - Framing I - Floor and Wall Framing
   - Framing II - Roof Framing
   - Roofing - Asphalt Strip Shingles, Wood Shakes, and Built-Up Roofs
   - Exterior Sidewall I - Brick Veneer and Fireplace Construction
   - Exterior Sidewall II - Wood Lap, Metal Lap, Plywood and Hardboard
   - Interior Wall Finish I - Gypsum Wallboard, Ceramic Tile, and Paneling
   - Interior Wall Finish II - Wallpaper, Plaster, Suspended Ceiling, and Ceiling Tile
   - Interior Trim and Stair Construction - Base, Ceiling, Window, and Door
   - Floor Covering - Carpet, Resilient, and Hardwood

The following audio-visual materials are available from Library, Manitoba Department of Education, 1181 Portage Avenue, Winnipeg, MB R3G 0T3:

1. 16 mm Films

   - Band Saw (colour)
   - Chisels (colour)
   - Claw Hammer and Nail Set (black and white)
   - Files (colour)
   - Files and Filing (black and white)
   - Glues and Clamps (colour)
   - Hammers and Nails (colour)
   - Hand Planes (black and white)
   - Hand Saws (black and white)
   - Hand Saws (colour)
   - Hand Saws: Cross Cut and Rip (black and white)
   - If I Had a Hammer (colour)
   - Introduction to Hand Tools (black and white)
   - Log House (colour)
   - Measuring and Layout Tools (colour)
   - Planes (black and white)
   - Planes (colour)
   - Portable Electric Sander (colour)
   - Scrapers and Abrasives (colour)
   - Screws, Screwdrivers (colour)
   - Scroll Saw (colour)
   - Sharpening Chisels, Plane Irons and Gauges (colour)
   - The ABC of Hand Tools - Part I (colour)
   - The ABC of Hand Tools - Part II (colour)
   - The Foundation (colour)
   - The Hand Planes (black and white)
   - Using Nails and Screws (black and white)
   - The Woodshell (colour)
   - Working Safety in the Shop (black and white)

2. Kits (Colour Slides, Cassettes, Carousel Slide Trays)

   - Aircraft Mechanic
   - Architectural Drafting
   - Career of an Automechanic
   - A Career in Cabinet Making
   - Careers in Graphic Arts
   - Silkscreening
   - The Electrician Kit
   - The Machinist in the Plastic Moulding Industry
   - Sheet Metal Working Is . . .

3. Videorecordings (Career Awareness Resource Library)

   - Carpentry B-2
   - Chemical and Plastics Processing F-1
   - Concrete Finishing B-3
   - Drafting 0-4
   - Electrical and Electronic Engineering A-8
   - Electrical Power, Lighting, and Wire Communications B-4
   - Electronic Products Manufacturing G-6
   - General Manufacturing G-8
   - Graphic Arts 0-6
   - Insulating and Roofing Occupations B-6
   - Mechanics 0-9
   - Metal Machining G-11
   - Metal Products F-4
   - Metal Shaping and Forming G-12
   - Photography D-5
   - Photographic Processing 0-13
   - Plastering, Painting and Paper Hanging B-8
   - Printing 0-14
   - Rubber and Plastic Products Manufacturing G-14
   - Sheet Metalwork G-15
   - Wood Processing F-9
   - Wood Products Manufacturing G-19

4. Videorecordings and Viewer's Guide (Fast Forward Series)

   - Humanized Technology (Series 1)
   - Implications (Series 2)

The following audio-visual materials are available from McIntyre Educational Media, Limited, 30 Kelfield Street, Rexdale, ON M9W 5A2:

1. Colour Filmstrips, Cassettes, Guide

   a) Woodworking, Hand Tools Explained
      - Measuring Tools
      - Marking Tools
      - Cutting Tools
      - Wood Planes
      - Forming and Shaping Tools
      - Files and Finishing Tools

   b) Woodworking Machine Operations Explained
      - Operating the Circular Saw
      - Operating the Scroll Saw
      - Operating the Band Saw
      - Operating the Router

The following audio-visual materials, published by McKnight Publishing Company, Bloomington, IL, are distributed by Nelson Canada, 1120 Birchmount Road, Scarborough, ON M1K 5G4:

1. Sound-Filmstrip Sets for Exploring the Construction Industry

   - How Construction Meets Your Needs
   - Managing Construction
   - Introduction to Surveying and Mapping
   - Building Foundations
   - Basic Carpentry Skills
   - Understanding Superstructures

- Introduction to Installing Utilities
- Enclosing and Finishing the Exterior
- Finishing the Interior and Completing the Site
- Buying and Selling Real Estate
- Understanding Building Maintenance, Repair, and Remodelling

2. Sound-Filmstrip Sets for World of Construction

- Managing Construction
- The Architect at Work
- Framing and Enclosing Residential Exteriors
- Completing Residential Interiors
- Landscaping
- The Engineer at Work
- The Contractor at Work
- Basic Carpentry Skills
- Building Foundations
- Understanding Masonry
- Identifying Superstructures
- Utility Systems
- Enclosing Nonresidential Structures
- Servicing Structures

3. Transparencies Set for World of Construction

The following audio-visual materials are available from Prentice-Hall Media, 1870 Birchmount Road, Scarborough, ON M1P 2J7:

1. Colour Filmstrips, Cassettes, Guide

a) Woodworking: Hand Tool Operations
- Planes and Their Uses
- Saws and Sawing
- Fastening Wood Parts
- Fastening with Dowels
- Various Woodworking Operations

b) Safety
- On Guard!
- The Safety Program
- Practicing Safety
- Protecting Your Eyes
- Using Hand and Bench Tools
- Operating Power Machines
- Preparing for Emergencies
- Wounds, Sprains, Fractures
- Shock, Fainting, Burns
- Artificial Respiration

2. Colour Filmstrips, Cassettes, Guide, Reproducible Masters

a) Woodworking: Power Tools
- The Router - Part 1
- The Router - Part 2
- The Electric Hand Drill
- The Saber Saw
- The Circular Saw

b) Foundations
- Excavation and Pouring Foundation Footings
- Erecting Wall Foundation Forms
- Pouring Concrete Foundation Walls
- Laying Concrete Block Foundations
- Concrete Flatwork: Slab Foundations and Basement Floors

c) Floor and Wall Framing
- Installing Sills, Girders, and Lally Columns
- Installing Floor Joists and Subflooring
- Constructing Shoes and Plates
- Assembling Exterior House Walls
- Erecting Exterior House Walls
- Constructing Interior Partitions

d) Roofing
  - Roof Design and Materials
  - Fundamentals of Roof Frame Construction
  - Framing the Roof
  - Sheathing and Overhang Finishing
  - Applying Finish Roofing

e) Completing the Exterior
  - Installing Exterior Doors and Windows
  - Exterior Wall Coverings
  - Installing Siding and Brick Veneer

f) Completing the Interior
  - Installing Thermal Insulation
  - Installing Interior Walls and Ceilings
  - Finish Floor Coverings
  - Finishing the Interior Doors, Cabinets, Molding, and Trim

PROFESSIONAL BOOKS

American Council of Industrial Arts Supervisors. Guidance in Industrial Arts Education for the '70s. Washington, DC: American Industrial Arts Associatiion, 1971.

----------. Industrial Arts in the Middle School. Washington, DC: American Industrial Arts Association, 1971.

American Council on Industrial Arts Teacher Education. Yearbooks 1-31. Bloomington, IL: McKnight and McKnight Publishing Company, 1951-present. (Published yearly.)

American Industrial Arts Association. Industrial Arts Standards and Handbook. Reston, VA: American Industrial Arts Association, 1982.

Butler, F. Coit. Instructional Systems Development for Vocational and Technical Training. Englewood Cliffs, NJ: Educational Technology Publications, 1972.

Henck, Richard M. Lesson Planning for Meaningful Variety in Teaching. Washington, DC: National Education Association of the United States, 1980.

Hoots, Jr., William R., ed. Industrial Arts in the Elementary School: Education in a Changing Society. Greenville, NC: East Carolina University, 1971.

Householder, Daniel L. Review and Evaluation of Curriculum Development in Industrial Arts Education. Bloomington, IL: McKnight Publishing Company, 1972.

Larson, Milton E. Teaching Related Subjects in Trade and Industrial and Technical Education. Columbus, OH: Charles E. Merrill Publishing Company, 1972.

Leighbody, Gerald B. and Donald M. Kidd. Methods of Teaching Shop and Technical Subjects. Albany, NY: Delmar Publishers, 1966.

Lindbeck, John R. Practical Guide to Industrial Arts Education. New York, NY: The Center for Applied Research in Education, 1972.

Maley, Donald A. The Industrial Arts Teacher's Handbook Techniques, Principles, and Methods. Boston, MA: Allyn and Bacon, 1978.

Modern School Shop Planning. Ann Arbor, MI: Prakken Publications, 1971.

Organization and Administration Forms for Industrial Arts, Series 1000. Kennedy, MN: Instructional Materials Services, n.d.

Palomaki, Mary Jane, ed. Teaching Handicapped Students Vocational Education. Reston, VA: National Education Association, 1981.

Roberts, Roy W. Vocational and Practical Arts Education. New York, NY: Harper and Row Publishers, 1971.

Sarkees, Michelle Donnelly et al. Vocational Special Needs: Preparing TE and I Teachers. Alsip, IL: American Technical Publications, Inc. 1982.

Silvius, G. Harold and Estell H. Curry. Managing Multiple Activities in Industrial Education. Bloomington, IL: McKnight and McKnight Publishing Company, 1971.

Wilbur, Gordon O. and Norman C. Pendered. Industrial Arts in General Education, 4th ed. New York, NY: Intext Educational Publishers, 1973.

PERIODICALS

Canadian Vocational Journal. Canadian Vocational Association, Suite 608, 252 Bank Street, Ottawa, ON K2P 1X3 (quarterly).

Careers. Reed Career Service, Suite 806 - 4445 Calgary Trail South, Edmonton, AB T6H 5C3.

Industrial Education. Harcourt Brace Jovanovich Publications, 757 Third Avenue, New York, NY 10017 (monthly).

Man/Society/Technology (formerly Journal of Industrial Arts Education), American Industrial Arts Association, 1914 Association Drive, Reston, VA 22091. (monthly).

National Safety News. National Safety Council, 444 N. Michigan Avenue, Chicago, IL 60611.

School Shop. Prakken Publications, 416 Longshore Drive, P. O. Box 8623, Ann Arbor, MI 48107 (monthly).

VocEd (formerly American Vocational Journal), American Vocational Association, 2020 N 14th Street, Arlington, VA 22201 (monthly).

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